Student :

Teacher :

BRIGIDINE COLLEGE RANDWICK

YEAR 10 YEARLY 2005

ADVANCED MATHEMATICS

TIME ALLOWED : 1.5 HOURS

Instructions :

* Show all necessary working.
* Marks may not be awarded for careless or poorly arranged work.
* All diagrams are NOT TO SCALE unless otherwise stated.
* Part A multiple choice (40 marks)
* Part B free response (40 marks)

Part A (MULTIPLE CHOICE)

1. Three cards are labelled with the digits 4,6,and 9. A two digit number is formed where the repetition of digits is allowed. The probability of forming an even number can best be described as:

   a. unlikely b. even chance c. likely d. almost certain

2. Expand and simplify $(m-4)^2$

   a. m^2-16 b. m^2+16 c. $m^2-4m+16$ d. $m^2-8m+16$

3. The graph described by the rule $yx = 7$ is a

   a. hyperbola b. straight line c. parabola d. exponential

4. Which of the following statements is true

   a. A square is a rectangle

   b. A rectangle is a square

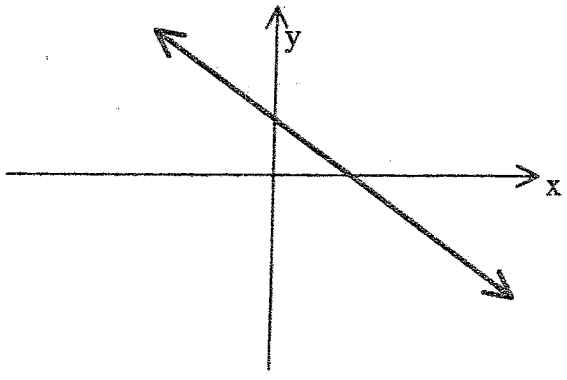
   c. A quadrilateral is a rhombus

   d. A trapezium is a parallelogram

5. What is the highest common factor of $24a^2b^3c^4$ and $18a^3b^2c^3$?

   a. $2a^2b^2c^3$ b. $6a^2b^2c^3$ c. $6a^3b^3c^4$ d. $8a^2b^2c^3$

6. The equation of the following line could be



   a. $y = 2x - 3$

   b. $y = 3 - 2x$

   c. $y = -2x - 3$

   d. $y = 2x + 3$

7. A recipe requires x grams of flour for y people. How many grams of flour would be needed for 1 person ?

   a. $x - y$ b. $y - x$ c. $\frac{y}{x}$ d $\frac{x}{y}$

8. Which of the following straight lines has been written in general form

a. $2x - y + 5 = 0$

b. $y - 2x + 5 = 0$

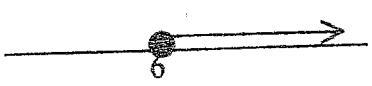
c. $\frac{x}{2} - y + 5 = 0$

d. $y = 2x + 5$

9. If $0.0049 = 4.9 \times 10^{n}$, then the value of n would be :

a. -3 b. -2 c. 2 d. 3

10. The solution to $8p - 6 \geq 9p$ is

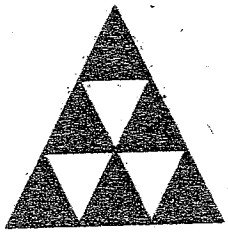
a. 

b. 

c. 

d. 

11. Each of the 9 equilateral triangles in the design has an edge length of 12 cm.



The ratio of the perimeter of one equilateral triangle to the perimeter of the design is

a. 1 : 4 b. 1 : 3 c. 3 : 1 d. 1 : 9

12. What would be the largest perimeter of a rectangle if its' area is 36 square metres and the dimensions of the figure are in whole numbers?

a. 24 m b. 72 m c. 74 m d. 80 m

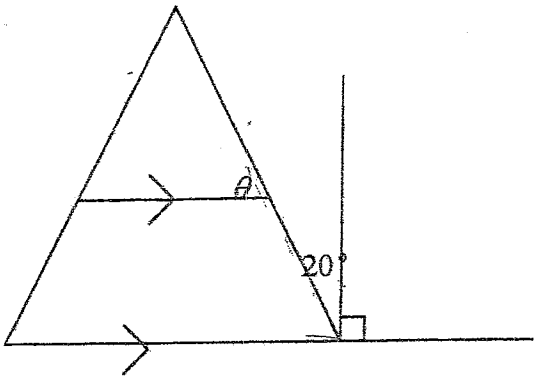
13. If $5 : 3 = 7 : k$, then $k =$

a. $\frac{21}{5}$ b. 5 c. $\frac{35}{3}$ d. 12

14. Calculate the balance on an investment if \$400 is invested for 7 months at 6% p.a.

a. \$14 b. \$168 c. \$414 d. \$568

15. In the diagram below , the angle θ is equal to



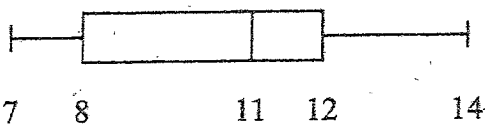
a. 20 degrees

b. 60 degrees

c. 70 degrees

d. 80 degrees

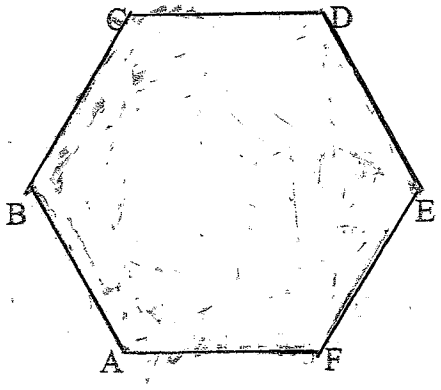
16. This box and whisker plot represents a set of scores.



What is the interquartile range of this set of scores?

a. 1 b. 3 c. 4 d. 7

17. ABCDEF is a regular hexagon. If the areas of the triangles ABC and DFA are m and n respectively then the area of the hexagon ABCDEF is equal to :



a. $(m + n)$

b. $\frac{3(m+n)}{2}$

c. $2(m + n)$

d. $4(m + n)$

18. The reciprocal of $\frac{1}{1+\frac{1}{2}}$

a. $\frac{3}{2}$ b. 2 c. $\frac{2}{3}$ d. 3

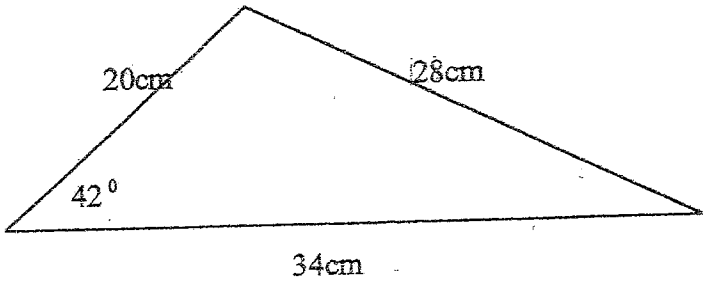
19. The area of the triangle drawn below is given by :

a. $0.5 \times 34 \times 28$

b. $0.5 \times 34 \times 28 \times \sin 42^\circ$

c. $0.5 \times 20 \times 28 \times \sin 42^\circ$

d. $0.5 \times 20 \times 34 \times \sin 42^\circ$



20. The name of the shape that has each exterior angle at 60 degrees is called

a. an equilateral triangle

b. a pentagon

c. a hexagon

d. an octagon

21. Two spheres have radii x cm and 2x cm respectively. The ratio of their volumes is

a. 1 : 2 b. 1 : 8 c. 1 : 4 d. cannot be found

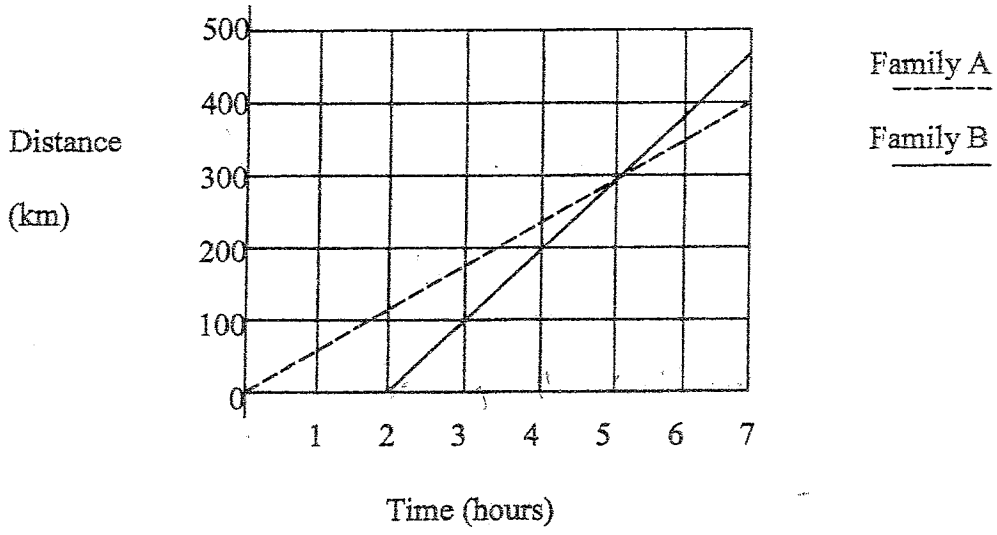
22. Solve for h , if $\frac{2h}{3} - \frac{h+5}{3} = 2$

a. -21 b. 1 c. 11 d. 21

23. 55km/hr in metres per second would be

a. 0.91 b. 1.52 c. 9.16 d. 15.28

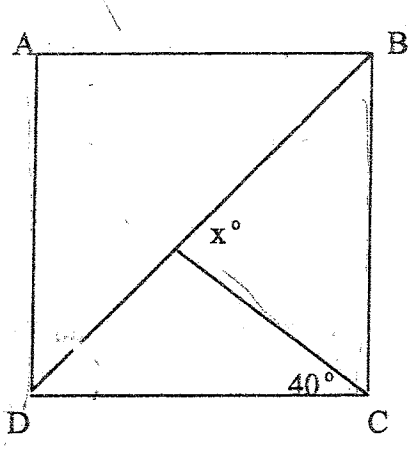
24. Two families are travelling on holidays. Family B leaves two hours later than Family A travelling at a faster speed.



How soon after Family B's departure will they meet Family A?

a. 2 hours b. 3hours c. 5 hours d. 7 hours

25. If ABCD is a square. Find x.



a. 80 degrees

b. 85 degrees

c. 90 degrees

d. 95 degrees

26. Simplify : $2a^\circ + (3a)^\circ \div 9^{\frac{1}{2}}$

a. $\frac{2}{3}$ b. 1 c. $1\frac{1}{3}$ d. $2\frac{1}{3}$

27. Determine the standard deviation for this stem and leaf display.

Stem	Leaf
2	5 5
3	0 0 5
4	2 4 4
5	
6	5

a. 11.98

b. 15.03

c. 34.5

d. 37.78

28. If $x^2 - 4x - 2 = 0$, then $x =$

a. $2 \pm \sqrt{2}$ b. $2 \pm \sqrt{3}$ c. $2 \pm \sqrt{5}$ d. $2 \pm \sqrt{6}$

29. Tanya works on the wharves unloading containers. Tanya is paid $14.20 per hour. Calculate the number of hours, at time and a half, that Tanya will have to work in order to earn the same amount of money working 9 hours at the normal rate.

a. 4.5 hours b. 6 hours c. 10.5 hours d. 13.5 hours

30. If $3^x = 2$, then 9^{2x} equals

a. 4 b. 6 c. 9 d. 16

31. Consider the following results for Cymri in a recent test for Maths and English :

	Score	*Average*	*Standard deviation*
Maths	*72*	*60*	*12*
English	*72*	*60*	*4*

Which of the following statements best describes her results.

a. She performed better in Maths because she was one standard deviation above the mean.

b. She performed better in Maths because the standard deviation was higher.

c. She performed better in English because she was 3 standard deviations above the mean.

d. She performed equally well in English and Maths because she was 12 marks above average for both tests.

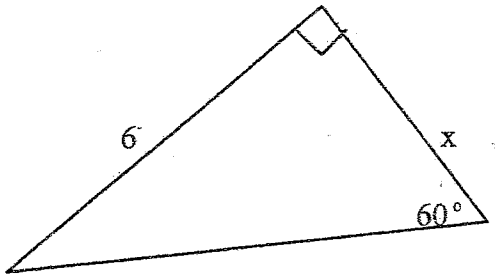
32. If n is any positive number, which one of the following is **always** equal to $\frac{1}{3}$?

a. $\frac{1}{n \times n \times n}$ b. $\frac{1}{3n}$ c. $\frac{n}{2+n}$ d. $\frac{n}{n+n+n}$

33. A machine packs chocolate coated almonds into boxes. The number of almonds in a box is normally distributed. The mean number per box is 75 and the standard deviation is 4. What percentage of the boxes contain less than 79 chocolates.

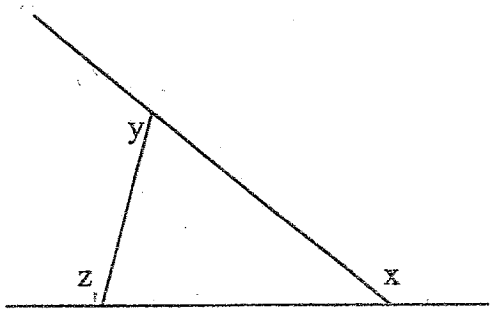
a. 32% b. 68% c. 84% d. 95%

34. Find x in exact form:



a. $\sqrt{3}$ b. $6\sqrt{3}$ c. $\frac{\sqrt{3}}{6}$ d. $2\sqrt{3}$

35. For the triangle shown, find x + y + z



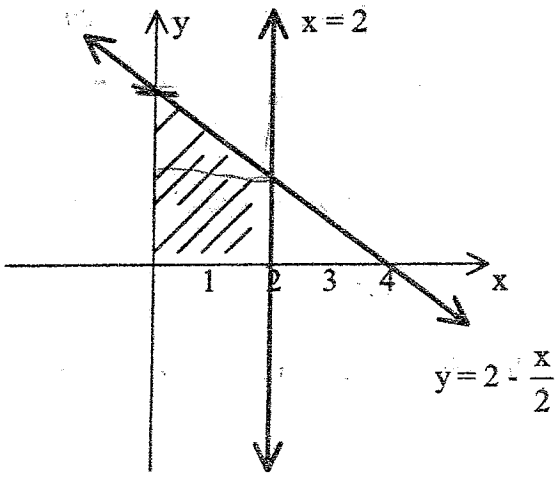
a. 180 degrees

b. 270 degrees

c. 360 degrees

d. 540 degrees

36. The area of the shaded region is



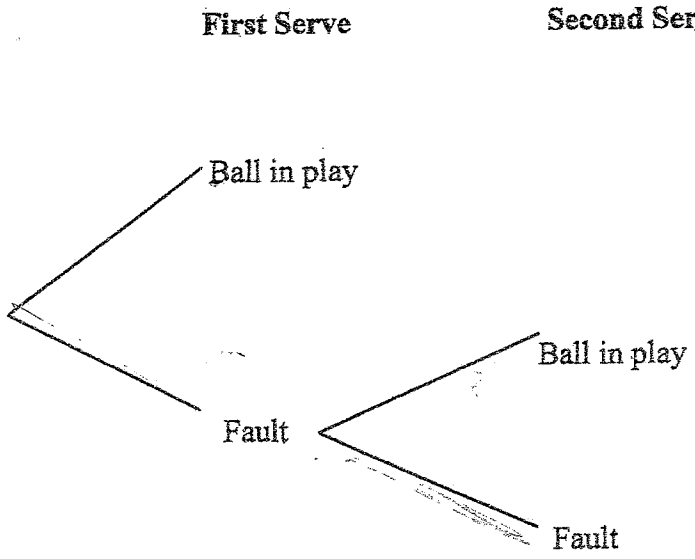
a. 1.5 units squared

b. 3 units squared

c. 5 units squared

d. 6 units squared

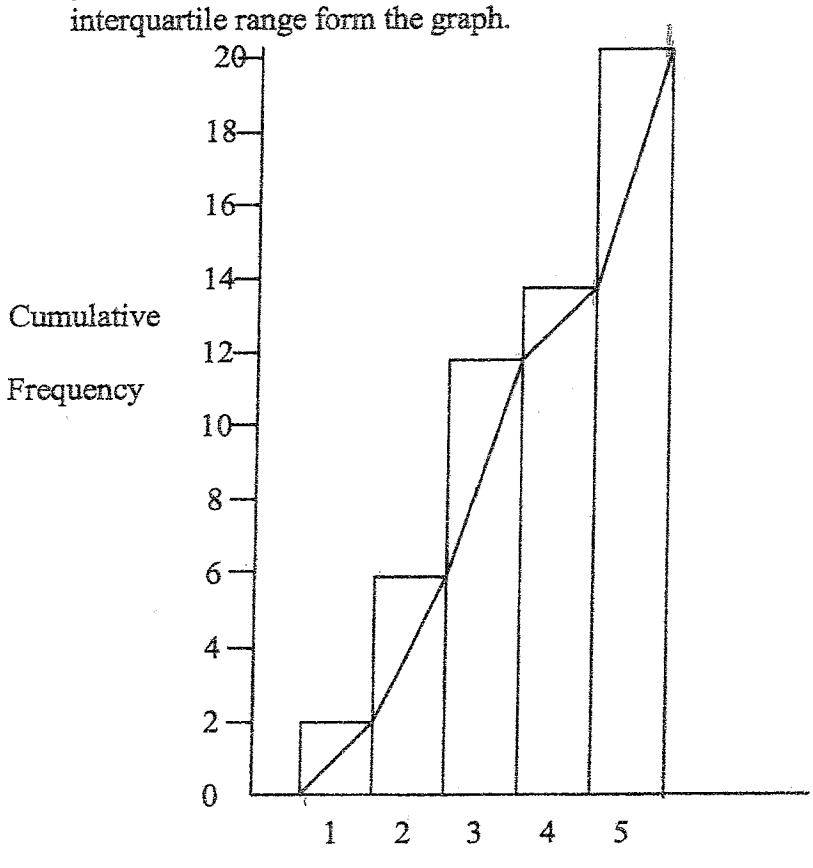
37. In the game of tennis, a player has two attempts at getting a ball in play for every point. If the first serve fails (fault), the player serves for the second time.
The following **incomplete** diagram shows the possible outcomes when a player serves.



A particular player has an 85% chance of getting a ball in play for each serve.
The probability (as a percentage) that this tennis player serves a "double fault" is :

a. 2.25 b. 15 c. 22.5 d. 30

38. Ashley recorded the distance jumped in the long jump event by some of her friends in year 10. The results are recorded on the cumulative frequency graph below. Calculate the interquartile range form the graph.

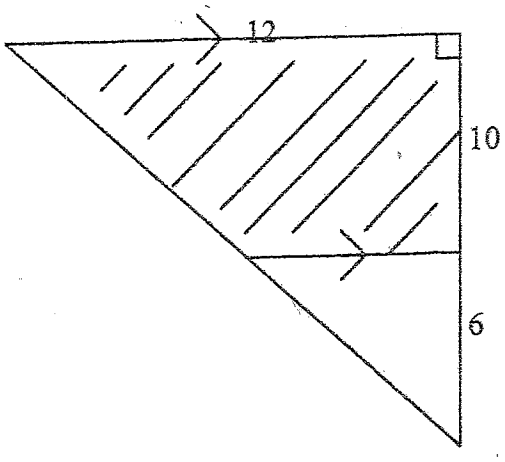


a. 1
b. 2
c. 3
d. 4

39. A block of land was bought for $50 000. Its value increased by 10% during the first year and then decreased by 10% the following year. Its value at the end of the 2 year period was :

a. $45 000 b. $49 500 c. $50 000 d. $55 500

40. The area (in square units) of the shaded region would be :



a. 4.5

b. 7.2

c. 82.5

d. 96

Part B (show all necessary working)

Student : _____

Teacher : _____

1. A bag contains 4 red and 5 green marbles. Two marbles are drawn at random. The colour of the first marble is noted but not replaced in the bag before the second is picked . Find the probability that : (3)

   a. Both marbles are red.

   b. Neither marble is red.

   c. The marbles are of different colours.

2. The sides of a triangle are 10 cm, 24 cm and 26 cm. (4)

   a. Show that the triangle is a right angle triangle.

   b. Find the area of the triangle.

   c. Find the size of the smallest angle (to the nearest minute).

3. A solid metal cone with a perpendicular height of 4.5m and diameter of 0.8m is melted down and cast into a sphere. Find the radius of the sphere correct to 2 significant figures. (3)

4. If $\frac{a}{b} = 3$, find the value of $\frac{2a+5b}{a+b}$. (2)

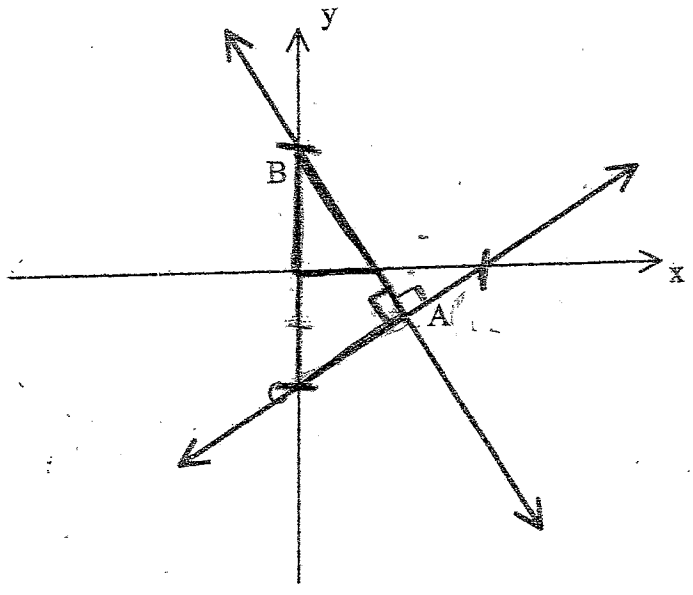
5. Kristy invests $4000 for 2 years at 6% p.a. compounded monthly. (5)

a. Calculate the amount the investment is worth after 2 years.

b. Determine the amount of interest earned.

c. Find the equivalent simple interest rate per annum (to 1 dec pl).

6. AB and AC are two perpendicular lines intersecting at A(12,-2). B is the point (0,6) and C is on the y-axis. (6)



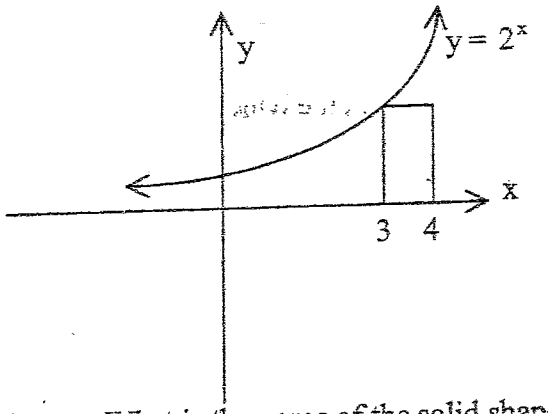
a. Show that the gradient of AB is $-\frac{2}{3}$.

b. Find the equation of AC

c. Determine the coordinate of point C

d. Find the area of triangle ABC.

7. The rectangle below is rotated about the x-axis (3)

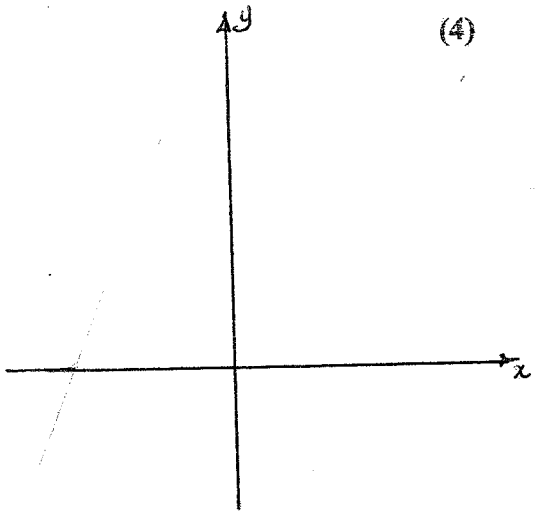


i. What is the name of the solid shape formed when the rectangle is rotated about the x-axis?

ii. Calculate the volume of the solid when the rectangle is rotated about the x-axis.

8. Consider the curve $y = 4x^2 + 12x + 9$ (4)

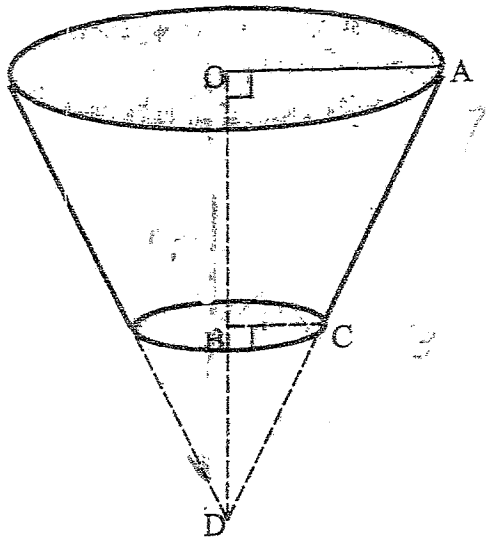
a. Determine the x intercept(s)



b. Find the coordinate of the vertex.

c. Sketch the curve on the axes given, showing the above features.

9. Consider the following solid, where BC = 4 cm, OA = 6cm, AD = 9 cm. (5)

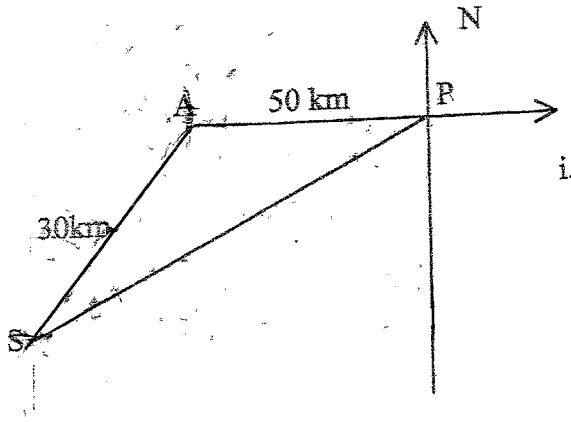


a. Prove ΔAOD is similar to ΔCBD.

b. Find the length of CD

c. Find the surface area of the solid.

10. A ship S sails due west from port P for 50 km to A. It then changes course and sails on a bearing of 210 degrees for 30km. (5)



i. Show that $\angle PAS = 120^\circ$

ii. Find the direct distance from the ship to port.

iii. Calculate the ships new bearing from port (to the nearest minute).

(end of exam)

BRIGIDINE – 2005 – YR10 – YEARLY

2005 YRLY

Student : _____

Teacher : SOLUTIONS

Year 10 Advanced Mathematics Multiple Choice Answer Sheet.

Circle Your Choice

1.	a	b	**c**	d	21.	a	**b**	c	d
2.	a	b	c	**d**	22.	a	b	**c**	d
3.	**a**	b	c	d	23.	a	b	c	**d**
4.	**a**	b	c	d	24.	a	**b**	c	d
5.	a	**b**	c	d	25.	a	**b**	c	d
6.	a	**b**	c	d	26.	a	b	c	**d**
7.	a	b	c	**d**	27.	**a**	b	c	d
8.	**a**	b	c	d	28.	a	b	c	**d**
9.	**a**	b	c	d	29.	a	**b**	c	d
10.	a	b	c	**d**	30.	a	b	c	**d**
11.	a	**b**	c	d	31.	a	b	**c**	d
12.	a	b	**c**	d	32.	a	b	c	**d**
13.	**a**	b	c	d	33.	a	b	**c**	d
14.	a	b	**c**	d	34.	a	b	c	**d**
15.	a	b	**c**	d	35.	a	b	**c**	d
16.	a	b	**c**	d	36.	a	**b**	c	d
17.	a	b	**c**	d	37.	**a**	b	c	d
18.	**a**	b	c	d	38.	a	b	**c**	d
19.	a	b	c	**d**	39.	a	**b**	c	d
20.	a	b	**c**	d	40.	a	b	**c**	d

Yr 10 ADV Yearly Marking Scheme.

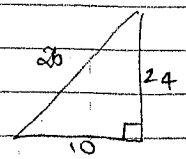
1.

(a) $P(RR) = P(R) \times P(R)$
$= 4/9 \times 3/8$
$= 1/6, \ 12/72$ 1

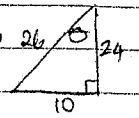
(b) $P(\bar{R}\bar{R}) = P(\bar{R}) P(\bar{R})$
$= 5/9 \times 4/8$
$= 5/18, \ 20/72$ 1

(c) $P(RG) \text{ OR } P(G,R) = 4/9 \times 5/8 + 5/9 \times 4/8$
$= 5/9, \ 40/72$ 1

2. (a) If $\triangle$ is right angled
$24^2 + 10^2 = 26^2$
LHS $= 676$
RHS $= 676$
$= \text{LHS}$
$\therefore \triangle$ is right angled. 1

(b) 

Area $= \frac{1}{2} \times 24 \times 10 \ cm^2$
$= 120 \ cm^2$ 1

(c) 

Smallest angle is opposite the smallest side 1

$\sin\theta = \frac{10}{26}$ $\quad \cos\theta = \frac{24}{26}$ $\quad \tan\theta = \frac{10}{24}$
$\theta = \sin^{-1}\left(\frac{10}{26}\right)$ $\quad \theta = \cos^{-1}\left(\frac{24}{26}\right)$ $\quad \theta = \tan^{-1}\left(\frac{10}{24}\right)$
$= 22°37'$ $\quad = 22°37'$ $\quad = 22°37'$ 1

$66°27' \rightarrow (1)$

Q3

$V_{CONE} = \frac{1}{3}\pi r^2 h$
$= \frac{1}{3} \times \pi \times 0.4^2 \times 4.5$
$= \frac{1}{3} \times \pi \times \left(\frac{2}{5}\right)^2 \times 4\frac{1}{2}$ → Allow (1)
$= \frac{6\pi}{25}$
$= 0.753982...$ 1

$\frac{1}{3}\pi \times 0.8^2 \times 4.5 =$
$= 3.015928...$

$V_{SPHERE} = \frac{4}{3}\pi R^3$

$\frac{6\pi}{25} = \frac{4}{3}\pi R^3$

$R^3 = \frac{6\pi}{25} \div \frac{4\pi}{3}$

$= \frac{{}^{3}6\pi}{25} \times \frac{3}{{}_{2}4\pi}$

$= \frac{9}{50}$ 1

$= 0.18$

$R = \sqrt[3]{\frac{9}{50}}$ 1

$= 0.56$

Q4 $\frac{a}{b} = 3$

$a = 3b$

$\frac{2a+5b}{a+b} = \frac{2\times 3b + 5b}{3b + b}$ 1

$= \frac{11b}{4b}$

$= \frac{11}{4}$ 1

5. $P = \$4000$

$I = 6\%$ p.a, compounded monthly

$= \frac{6}{12}\%$ per month

$= 0.5\%$ per month

$n = 2$ years

$= 24$ months

(a) $A = P(1+\frac{r}{100})^n$

$= \$4000(1.005)^{24}$

$= \$4508.64$

(b) Interest $= \$4508.64 - \$4000$

$= \$508.64$

(c) $I = PRN$

$508.64 = \$4000 \times R \times 2$

$R = 508.64 \div 8000$

$= 6.358\%$

$= 6.4\%$ (to 1 d.p)

6. A $(12,-2)$ B $(0,6)$ C $(0,y)$

(a) $m_{AB} = \frac{y_2 - y_1}{x_2 - x_1}$

$= \frac{6--2}{0-12}$

$= \frac{8}{-12}$

$= -\frac{2}{3}$

(b) $m_{AC} = -\frac{1}{m_{AB}}$

$= \frac{3}{2}$

AC is: $y - y_1 = m(x - x_1)$ or $y = mx + b$

$y + 2 = \frac{3}{2}(x - 12)$

$2y + 4 = 3x - 36$

$y = \frac{3}{2}x - 20$

$y = \frac{3}{2}x + b$

$-2 = \frac{3}{2} \times 12 + b$

$-2 = 18 + b$

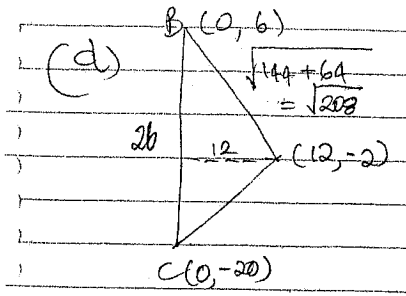
$b = -20$

$y = \frac{3}{2}x - 20$

(c) $y = \frac{3}{2}x - 20$

C is $(0,-20)$

(d)



Area $= \frac{1}{2} \times 26 \times 12$ unit^2

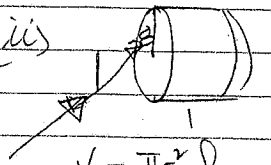
$= 156$ unit^2

$(0,-5)$ $(12,-2)$

$\sqrt{(12-0)^2 + (-2+5)^2} = \sqrt{144+9} = \sqrt{153}$

Q7 (i) Cylinder

(ii)



$V = \pi r^2 h$

$= \pi \times 8^2 \times 1$

$= 64\pi$ unit^3, 201.06 unit^3

Rectangular Prism

$V =$

Q8

(a) $y = 4x^2 + 12x + 9$

For x-intercept $y = 0$

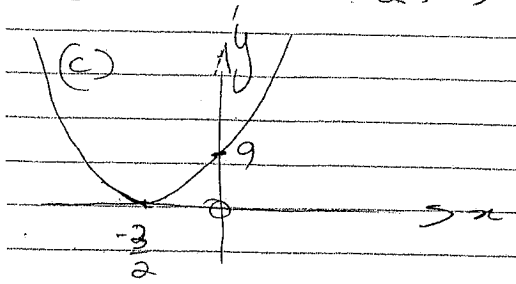
i.e $4x^2 + 12x + 9 = 0$

$(2x+3)^2 = 0$

$x = -\frac{3}{2}$

(b) Vertex: $(-\frac{3}{2}, 0)$

(c)

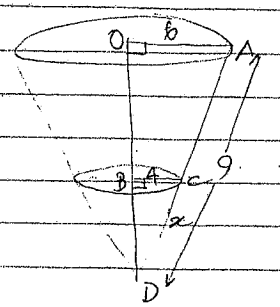


$4x^2 + 12x + 3^2$

$(2x)^2 + 2\times(2x)\times 3 + 3^2$

$(2x+3)$

9



(a) In $\triangle AOD$ and $\triangle CBD$

$\angle ODA = \angle BDC$ (Common) A

$\angle AOD = \angle CBD$ (Given) A

$\therefore \triangle AOD \,|||\, \triangle CBD$

(b) As $\triangle AOD \,|||\, \triangle CBD$

$\frac{x}{4} = \frac{9}{6}$

$x = 4\times\frac{9}{6} = 6$

Q9 (cont)

(c) Surface Area

= (Surface area of large cone) − (Curved surface area of small cone) + (Area of small circle)

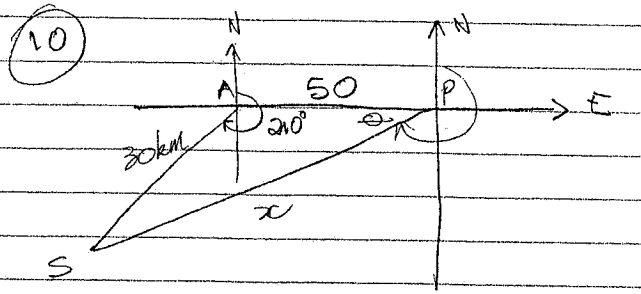
$= \pi RS + \pi R^2 - \pi rs + \pi r^2$

$= \pi\times 6\times 9 + \pi\times 6^2 - \pi\times 4\times 6 + \pi\times 4^2$

$= \pi(6\times 9 + 6^2 - 4\times 6 + 4^2)$

$= 82\pi\ cm^2,\ 257.61\ cm^2$

10



(i) $\angle PAS = 210° - 90°$

$= 120°$

(ii) $x^2 = 30^2 + 50^2 - 2\times 30\times 50\times\cos 120°$

$= 4900$

$\therefore x = \sqrt{4900}$

$= 70$

SP $= 70$ km

(ii) Bearing $= 270° - \angle APS$

$\cos\angle APS = \frac{50^2 + 70^2 - 30^2}{2\times 50\times 70}$ or $\sin\angle APS = \frac{30\sin 120°}{70}$

$\angle APS = 21°47'$ $\angle APS = 21°47'$

Bearing $= 270° - 21°47'$

$= 248°13'$