



KAMBALA

Name: _____

Yearly Examination
November 2014

Year 9 Mathematics
Stage 5.3

General Instructions

- Working time – 90 minutes
- Reading time – 5 minutes
- Calculators may be used
- Answer Section I on the multiple choice answer sheet provided.
- Answer Section II in the spaces provided on this test paper.
- Show all necessary working in Section II.
- Marks may not be awarded if working is not shown or is untidy.

Total marks – 75

Section I

15 marks

- Attempt Questions 1 – 15
- Allow about 20 minutes for this section

Section II

60 marks

- Attempt Questions 16 – 21
- Allow about 70 minutes for this section

Kambala – Year 9 Mathematics 5.3 – Task 4 – November 2014
Section I

15 Marks

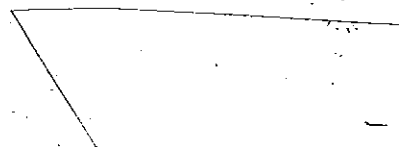
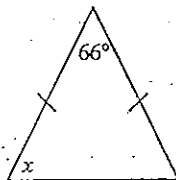
Attempt Questions 1 – 15

Allow about 20 minutes for this section

Use the multiple-choice answer sheet for Questions 1 – 15.

-
- 1 What is 4.09784 correct to three significant figures?
- (A) 4.09 (B) 4.10 (C) 4.097 (D) 4.098
-
- 2 Write $\sqrt{x^3}$ in index form
- (A) $x^{\frac{5}{4}}$ (B) $x^{\frac{4}{5}}$ (C) $x^{\frac{4}{5}}$ (D) $x^{\frac{-5}{4}}$
-
- 3 A laptop bought new for \$1099 has depreciated in value to \$969 after one year. What is the percentage rate of depreciation?
- (A) 88.2% (B) 11.8% (C) 13.4% (D) 47.4%
-
- 4 The bearing of south-east is
- (A) 135° (B) 145° (C) 140° (D) 150°
-
- 5 Kate receives \$1000 for her birthday. She invests the money at 5% per annum simple interest. How much interest will she earn after three years?
- (A) \$50.00 (B) \$150.00 (C) \$157.63 (D) \$1157.63
-
- 6 The expansion of $(m+5)(m-3)$ is
- (A) m^2-15 (B) $m^2-2m-15$ (C) $m^2+2m-15$ (D) m^2-2m-8
-

7 The value of x is



- (A) 114° (B) 147° (C) 57° (D) 67°

8 The price of a Blue Ray player is \$220 including 10% GST. What was the original price of the player before GST was added?

- (A) \$198 (B) \$202 (C) \$242 (D) \$200

9 If $x^2 + 8x + p = (x + q)^2$, what are the values of p and q ?

- (A) $p = 4$ and $q = 16$ (C) $p = 16$ and $q = 16$
 (B) $p = 16$ and $q = 4$ (D) $p = 8$ and $q = 4$

10 Simplify $\frac{a^6 b}{a^2 b^2}$

- (A) $\frac{a^3}{b}$ (B) $\frac{a^4}{b}$ (C) $a^3 b$ (D) $a^4 b$

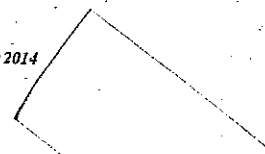
11 The size of the interior angle in a regular hexagon is

- (A) 60° (B) 720° (C) 125° (D) 120°

12 Write the following in simplified index form $\sqrt{2 \cdot \sqrt{2}}$

- (A) $2^{\frac{1}{2}}$ (B) $2^{\frac{1}{4}}$ (C) $2^{\frac{3}{4}}$ (D) $2^{\frac{3}{2}}$

13 Solve for x : $3x^2 + 2 = 29$



- (A) $x = 10\frac{1}{3}$ (B) $x = \pm 10\frac{1}{3}$ (C) $x = 3$ (D) $x = \pm 3$

14 A car wheel has a diameter of x cm. The number of revolutions it would make travelling over a distance of 1 metre would be

- (A) $\frac{100\pi}{x}$ (B) $100\pi x$ (C) $\frac{100}{\pi x}$ (D) $\frac{\pi x}{100}$

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

- (A) $\frac{1}{n^3}$ (B) $\frac{1}{3n}$ (C) $\frac{n}{2+n}$ (D) $\frac{n}{n+n+n}$

End of Section I

Section II

60 Marks

Attempt Questions 16 - 21

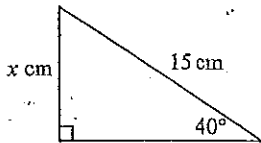
Allow about 70 minutes for this section

Answer each question in the space provided. Show all necessary working.

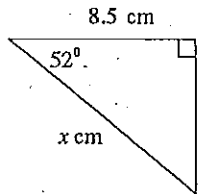
Question 16 (10 marks)

- (a) For each of the diagrams below, find the length of the side marked x cm. Give your answers correct to 1 decimal place.

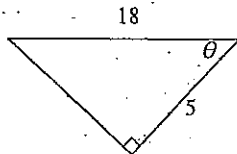
(i)



(ii)



- (b) Find the value of θ to the nearest degree.



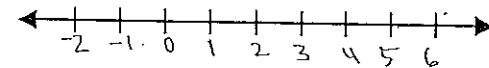
- (c) Solve for x : $\frac{3x-1}{5} - 3 = 4$

2
1 1/2

- (d) (i) Solve for x : $1 - 2x \geq 7 - 4x$

2

- (ii) Graph the solution set on the number line below



1

Question 17 begins over the page

Question 17 (10 marks)

- (a) Find Jack's hourly rate of pay if his annual salary is \$36 062 and he works 38 hours per week. Assume 52 weeks for the full year. 2

- (b) Mary earns \$1040 per week. Calculate her total holiday pay for 4 weeks including leave loading at 17.5%. 2

- (c) Jessica has a part time job at a Florist shop. Calculate her hourly rate of pay if she received \$637 for working 18 hours at normal pay, 6 hours at time and a half and 4 hours at double time. 2

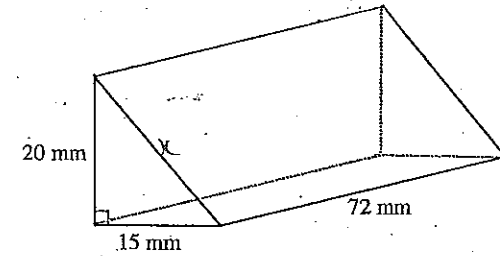
- (d) Explain the difference between gross income and taxable income. 1

- (e) \$6000 is invested at 8.4% p.a. for 4 years. Calculate the final value of this investment when interest is compounded annually. 1

- (f) Make m the subject of the equation $z = \frac{x-m}{p}$. 2

Question 18 (10 marks)

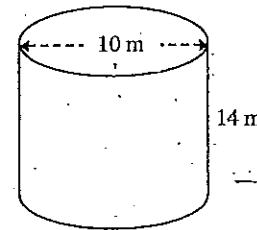
- (a) A triangular prism has dimensions as shown in the diagram below.



Find the surface area of the solid

3

- (b) Calculate the capacity of the cylinder. Give your answer correct to the nearest L. 3

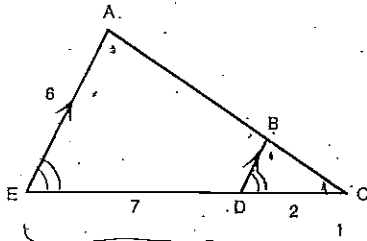


- (c) For the line segment joining the points $A(-3,1)$ and $B(3,5)$, find 4

- (i) the length (to two decimal places), (ii) the midpoint.

Question 19 (10 marks)

- (a) In the diagram below, AE is parallel to BD , $AE = 6$ units, $DE = 7$ units and $DC = 2$ units.



- (i) Prove that $\triangle ACE$ is similar to $\triangle BCD$.

2

- (ii) Find the length of BD .

1

- (b) For each of the following linear relations, state the value of the gradient (m) and the y -intercept (b).

4

(i) $y = 2x - 1$

$m =$ _____

$b =$ _____

(ii) $2x + 3y = 9$

$m =$ _____

$b =$ _____

- (c) Using your answer from (b) (i) above, find the equation of the line that is perpendicular to the line $y = 2x - 1$ and passes through the point $(4, -1)$.

3

Question 20 (10 marks)

- (a) Simplify the following expressions, give answers with positive indices.

8

(i) $3m^2n \times 8m^5n^3 \times \frac{1}{2}m^{-3}$

(ii) $\left(\frac{2x^2}{y^{-1}}\right)^{-3}$

(iii) $\frac{3x}{5} \div \frac{x}{3}$

(iv) $\frac{x^2 - 4}{xy} \times \frac{3y}{x - 2}$

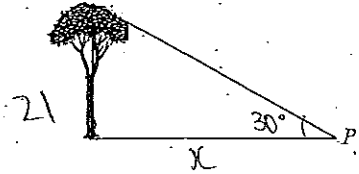
- (b) Factorise the trinomial $2x^2 - 15x + 18$.

2

Question 21 begins over the page

Question 21 (10 marks)

- (a) Standing at a point P on level ground with the base of a tree, the angle of elevation to the top of the tree is 30° . If the tree is 21 metres high, find the exact distance from the base of the tree to the point P . 2



- (b) Solve for x and y . 2

$$\begin{aligned} 4x - y &= 6 \\ x + y &= 4 \end{aligned}$$

- (c) Simplify $(p+2)^2 - (p-2)^2$. 2

- (d) Simplify $\frac{x^2 - 5x + 6}{2 - x}$. 2

- (e) Nick has twice, as much money as Sam.
If I give Sam \$250, he will have three times as much as Nick.

How much did each of them have originally?

(You must show algebraically how you get your solutions)

2

End of Section II

MULTIPLE CHOICE ANSWERS

1. (B) 2. (A) 3. (B) 4. (A)
 5. (B) 6. (C) 7. (C) 8. (D)
 9. (B) 10. (B) 11. (D) 12. (C)
 13. (D) 14. (C) 15. (D)

Section II

60 Marks

Attempt Questions 16 - 21

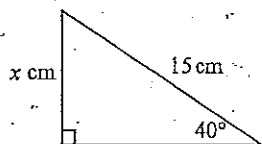
Allow about 70 minutes for this section

Answer each question in the space provided. Show all necessary working.

Question 16 (10 marks)

- (a) For each of the diagrams below, find the length of the side marked x cm. Give your answers correct to 1 decimal place.

(i)



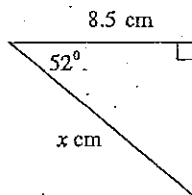
$$\sin 40^\circ = \frac{x}{15}$$

$$x = \sin 40^\circ \times 15$$

$$x = 9.6 \text{ cm (1 d.p.)}$$

3

(ii)



$$\cos 52^\circ = \frac{8.5}{x}$$

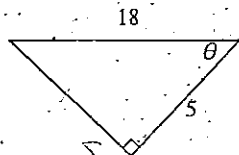
$$x \times \cos 52^\circ = 8.5$$

$$x = \frac{8.5}{\cos 52^\circ}$$

$$x = 13.8 \text{ (1 d.p.)}$$

2

- (b) Find the value of θ to the nearest degree.



$$\cos \theta = \frac{5}{18}$$

$$\theta = \cos^{-1} \frac{5}{18}$$

$$\theta = 73^\circ 52'$$

$$= 74^\circ$$

- (c) Solve for x : $\frac{3x-1}{5} - 3 = 4$

$$3x - 1 - 15 = 20$$

$$3x - 16 = 20$$

$$3x = 36$$

$$x = 12 \text{ careful}$$

11/2

- (d) (i) Solve for x : $1 - 2x \geq 7 - 4x$

$$1 - 2x \geq 7 - 4x$$

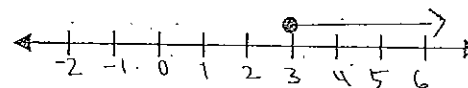
$$1 + 2x \geq 7$$

$$2x \geq 6$$

$$x \geq 3$$

2

- (ii) Graph the solution set on the number line below



1

Question 17 begins over the page

Question 17 (10 marks)

- (a) Find Jack's hourly rate of pay if his annual salary is \$36 062 and he works 38 hours per week. Assume 52 weeks for the full year.

$$(\$36\ 062 \div 52) \div 38$$

$$= \$18.25$$

- (b) Mary earns \$1040 per week. Calculate her total holiday pay for 4 weeks including leave loading at 17.5%.

$$\$1040 \times 4 + 17.5\% \times \$1040 \times 4$$

$$= \$4\ 232.80$$

- (c) Jessica has a part time job at a Florist shop. Calculate her hourly rate of pay if she received \$637 for working 18 hours at normal pay, 6 hours at time and a half and 4 hours at double time. Let x be no. of hours she worked.

$$\$637 = (18 \times 1 \times x) + (6 \times 1.5 \times x) + (4 \times 2 \times x)$$

$$= 18x + 9x + 8x \quad \$637 = 35x$$

$$x = \$637 \div 35 \quad x = \$18.20$$

- (d) Explain the difference between gross income and taxable income.

Gross income is income before any deductions.

taxable income is the income that is used to calculate the tax payable.

- (e) \$6000 is invested at 8.4% p.a. for 4 years. Calculate the final value of this investment when interest is compounded annually. $P(1+R)^T$

$$\$6000 (1 + 0.084)^4$$

$$= \$6000 \times 1.084^4$$

$$= \$8284.54$$

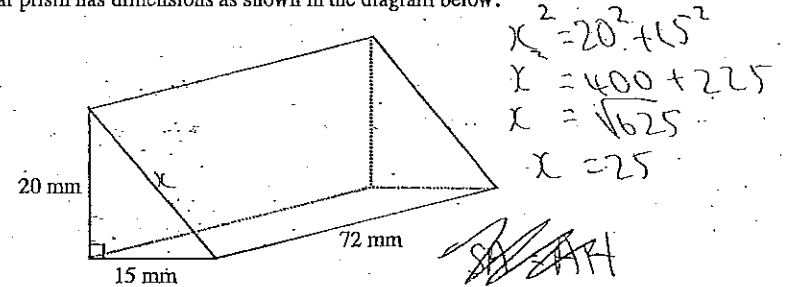
- (f) Make m the subject of the equation $z = \frac{x-m}{p}$.

$$zp = x - m \quad zp - x = -m$$

$$m = -zp + x$$

Question 18 (10 marks)

- (a) A triangular prism has dimensions as shown in the diagram below.



$$x^2 = 20^2 + 15^2$$

$$x = \sqrt{400 + 225}$$

$$x = \sqrt{625}$$

$$x = 25$$

Find the surface area of the solid

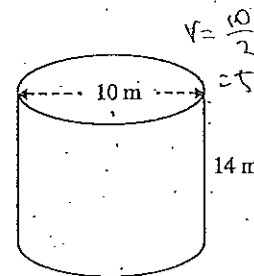
Triangles = $\frac{20 \times 15}{2} \times 2 = 300$

Side 1 = $72 \times 25 = 1800$ Total = $300 + 1800 + 1080 + 1440 = 4620$

Base = $72 \times 25 = 1800$

Side 2 = $20 \times 72 = 1440$

- (b) Calculate the capacity of the cylinder. Give your answer correct to the nearest L.



$$r = \frac{10}{2} = 5$$

$$V = \pi r^2 \times h$$

$$= 5^2 \pi \times 14$$

$$= 25\pi \times 14$$

$$= 1099.557 \text{ m}^3 = 1100 \text{ m}^3$$

$$= 1100 \text{ L}$$

- (c) For the line segment joining the points A(-3,1) and B(3,5), find

- (i) the length (to two decimal places).

$$D = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$D = \sqrt{(3 - (-3))^2 + (5 - 1)^2}$$

$$D = \sqrt{(6)^2 + (4)^2}$$

$$D = \sqrt{36 + 16}$$

$$D = \sqrt{52}$$

$$D = 7.21 \text{ units}$$

- (ii) the midpoint.

$$M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

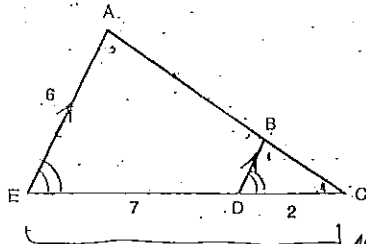
$$M = \left(\frac{-3 + 3}{2}, \frac{1 + 5}{2} \right)$$

$$M = \left(\frac{0}{2}, \frac{6}{2} \right)$$

$$M = (0, 3)$$

Question 19 (10 marks)

- (a) In the diagram below, AE is parallel to BD , $AE = 6$ units, $DE = 7$ units and $DC = 2$ units.



(i) Prove that $\triangle ACE$ is similar to $\triangle BCD$.

$\angle ACE = \angle BCD$ (it is a shared angle)

$\angle CAE = \angle CBD$ (corresponding angles on parallel lines are equal)

$\therefore \triangle ACE \sim \triangle BCD$ (2 pairs of equal angles)

(ii) Find the length of BD .

Scale factor = $9:2 = 4.5:1$

$BD = AE \div 4.5$

$BD = 1\frac{1}{3}$ units

- (b) For each of the following linear relations, state the value of the gradient (m) and the y-intercept (b).

(i) $y = 2x - 1$

$m = 2$

$b = -1$

(ii) $2x + 3y = 9$

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

$b = 3$

$3y = -2x + 9$
 $y = -\frac{2}{3}x + 3$

- (c) Using your answer from (b) (i) above, find the equation of the line that is perpendicular to the line $y = 2x - 1$ and passes through the point $(4, -1)$.

$m_1 = 2$ $\therefore 2 \times m_2 = -1 \therefore m_2 = -\frac{1}{2}$

$y - y_1 = m(x - x_1)$

$y - 4 = -\frac{1}{2}(x + 1)$ ← minus

$y - 4 = -\frac{1}{2}x + \frac{1}{2}$

$y = -\frac{1}{2}x + \frac{3}{2}$ close

Question 20 (10 marks)

- (a) Simplify the following expressions, give answers with positive indices.

(i) $3m^2n \times 8m^5n^3 \times \frac{1}{2}m^{-3}$

$3m^2n \times 8m^5n^3 \times \frac{1}{2}m^{-3}$

$12m^4n^4$

(ii) $\frac{(2x^2)^{-3}}{y^{-1}} = \frac{y^3}{8x^6}$

$\frac{1}{8x^6} \div \frac{1}{y^3} = \frac{1}{8x^6} \times \frac{y^3}{1}$
 $= \frac{y^3}{8x^6}$

(iii) $\frac{3x \cdot x}{5 \cdot 3}$

$\frac{3(3x)}{15} = \frac{5(x)}{15}$

$\frac{9x}{15} = \frac{5x}{15}$

$\frac{4x}{15}$

(iv) $\frac{x^2 - 4}{xy} \times \frac{3y}{x - 2} = \frac{(x+2)(x-2)}{xy} \times \frac{3y}{x-2}$

$\frac{x+2}{xy} \times \frac{3y}{1} = \frac{3y(x+2)}{xy}$

$\frac{3(x+2)}{x}$

- (b) Factorise the trinomial $2x^2 - 15x + 18$.

$2x^2 - 12x - 3x + 18$

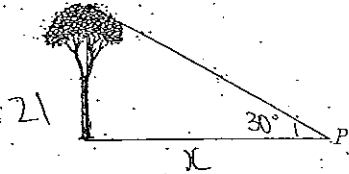
$2x(x - 6) - 3(x - 6)$

$(x - 6)(2x - 3)$

Question 21 begins over the page

Question 21 (10 marks)

- (a) Standing at a point P on level ground with the base of a tree, the angle of elevation to the top of the tree is 30° . If the tree is 21 metres high, find the exact distance from the base of the tree to the point P.



$$\tan 30^\circ = \frac{21}{x}$$

$$x \times \tan 30^\circ = 21$$

$$x = \frac{21}{\tan 30^\circ}$$

$$= \frac{21}{\frac{1}{\sqrt{3}}} = 21\sqrt{3} \text{ m}$$

2

- (b) Solve for x and y.

$$\begin{aligned} 4x - y &= 6 & \textcircled{1} \\ x + y &= 4 & \textcircled{2} \end{aligned}$$

① + ②
 $4x - y = 6$
 $x + y = 4$

 $5x = 10$
 $x = 2$

① - ②
 $4x - y = 6$
 $x + y = 4$

 $3x - 2y = 2$
 $x = 2$
 $3(2) - 2y = 2$
 $6 - 2y = 2$
 $-2y = -4$
 $y = 2$

2

- (c) Simplify $(p+2)^2 - (p-2)^2$.

$$\begin{aligned} &(p+2)(p+2) - (p-2)(p-2) \\ &(p^2 + 4p + 4) - (p^2 - 4p + 4) \\ &p^2 + 4p + 4 - p^2 + 4p - 4 = 4p + 4p \\ &= 8p \end{aligned}$$

2

- (d) Simplify $\frac{x^2 - 5x + 6}{2 - x}$.

$$\begin{aligned} &= \frac{(x-3)(x-2)}{-(x-2)} \\ &= 3-x \end{aligned}$$

2

- (e) Nick has twice, as much money as Sam. If I give Sam \$250, he will have three times as much as Nick.

How much did each of them have originally?

(You must show algebraically how you get your solutions)

2

Let N = Nick's amount of money
 Let S = Sam's amount of money

$$2S = N \quad \textcircled{1} \quad \text{sub } S = 50 \text{ into } \textcircled{1}$$

$$\begin{aligned} S + 250 &= 3N & \textcircled{2} \\ S + 250 &= 6S & \text{sub } \textcircled{1} \text{ into } \textcircled{2} \end{aligned}$$

$$5S = 250$$

$$S = 50$$

\therefore Nick had \$100 and Sam had \$50

2

End of Section II