

Section II – Measurement (23 marks)

NAME: _____

CLASS: _____

1.
2. Convert the following units. [2]

a) $50^{\circ}24' =$ _____ degrees
b) $2.3\text{m}^2 =$ _____ cm^2

3. The water from a flat rectangular roof $12\text{m} \times 15\text{m}$ is collected in a cylindrical water tank of diameter 2.2m .

a) If 10mm of rain falls on the roof, find the [1] volume of water which has fallen on the roof.

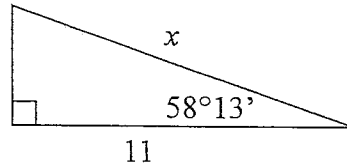
b) What is the rise in the water level of the tank when this volume of water is collected? (nearest cm) [2]

c) The cylindrical water tanks is 1.5m high. The curved part of the tank is to be painted with rust proofing. What is the area to be painted to the nearest m^2 ? [2]

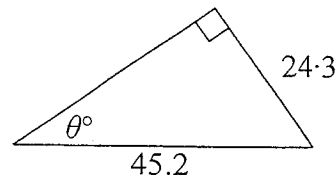
4. Answer each of the following.

a) Given $\tan \theta^{\circ} = \frac{26.1}{8.7}$, find θ° to the nearest minute. [1]

b) Find x to 1 decimal place. [2]



c) Find θ° to the nearest degree. [2]



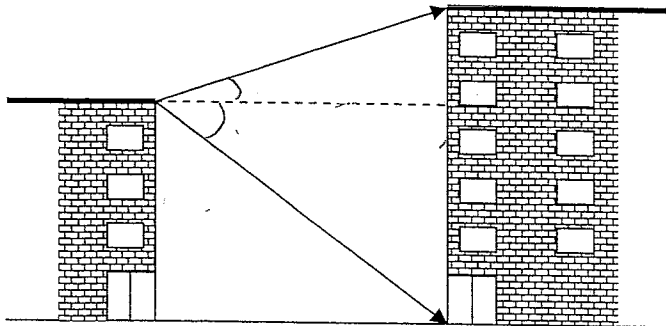
5. If $\sin \theta = \frac{1}{4}$, find the exact value [2] of $\cos \theta$.

Year 9 Stage 5.3 Examination

Part B – Calculator

6. An observer, from the top of a building 66 metres high, finds the angle of elevation of the top of a taller building to be 34° . The angle of depression of the foot of the same building is 51° .

a) Mark all the given information on the diagram given below. [1]

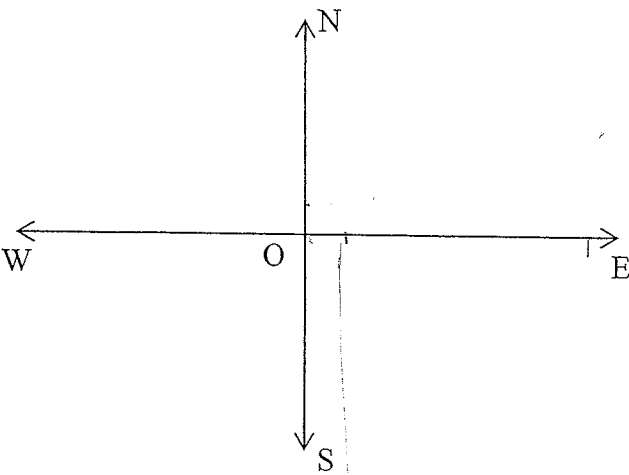


b) (i) Find the distance between the two buildings. to the nearest m [2]

(ii) Find the height of the taller building. [2]

7. A ship leaves port O and travels 380km on a bearing of 145° to port A.

a) Put this information on the diagram. [1]



b) How far East of port O is port A? [2]

Answer to the nearest km

c) What is the bearing of O from A? [1]

Answer to the nearest degree

Section III – Algebra (43 marks)

NAME: _____

CLASS: _____

1. Simplify $9p - 3p \times 2$. [1]

2. Expand and simplify $(5g + 3)(4g - 1) - (g + 2)(g - 2)$. [2]

3. If $y = 7 + 5(4 - x)$, find x , when $y = 0$. [2]

4. Solve $\frac{2x+3}{3} - \frac{3x+1}{4} = 2$. [3]

5. Solve $4 - 3x \leq 9$. [1]

6. Use an equation to solve this problem.
“A number is increased by 5 and then trebled.
The result is 6 more than two thirds of the
number. Find the number”. [3]

7. The velocity of an object is given by $v^2 = u^2 + 2as$. Find u when $v = 13$, $a = 6$ and $s = 12$. [1]

8. For the points A (3, -1) and B (-5, 0), find...

a) The gradient of AB. [1]

b) The distance AB. [1]

c) The midpoint of AB. [1]

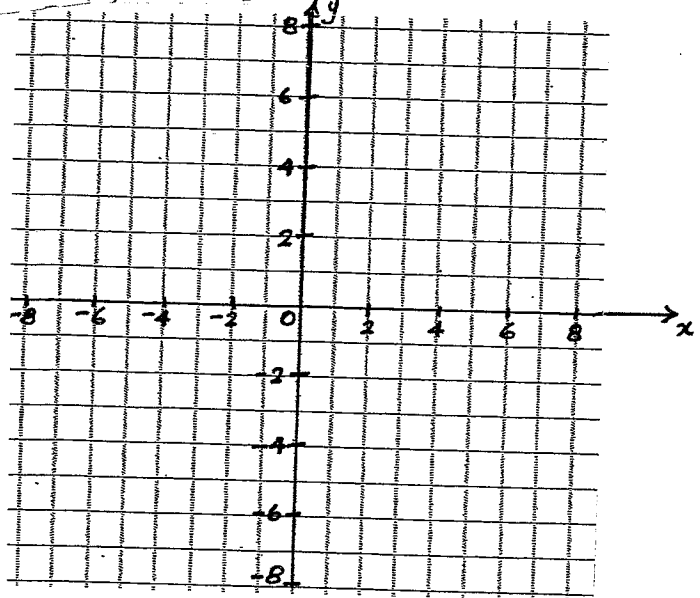
d) The equation of the line which passes through A and B. Give your answer in general form. [3]

e) Where does the line AB cross the x -axis? [1]

f) Find the equation of the line parallel to AB which also passes through the point (0, 8). [2]

9. Find k if $2x + ky = 5$ is perpendicular to $x - 3y = 11$. [2]

10. On the number plane below...



a) Sketch $2x + y = 6$. [1]

b) Hence shade the region where $2x + y \leq 6$. [1]

c) Clearly indicate on the number plane [3]
the region where $2x + y \leq 6$ and $x < 4$
are both true.

11. Factorise fully...

a) $xp + 2x - yp - 2y$ [1]

b) $x^2 - 5x - 6$ [1]

c) $5x^2 + 7x - 6$ [1]

d) $2x^3 - 18x$ [2]

12. Simplify...

a) $\frac{2a^2x}{5} \times \frac{10}{4ax^2}$ [1]

b) $\frac{x-2}{3x^2-6x}$ [2]

c) $\frac{x^2-25}{3x^2+15x} \div \frac{x^2-4x-5}{x^2+x}$ [3]

d) $\frac{2}{x^2-x} - \frac{3}{x^2-1}$ [3]

END of EXAMINATION

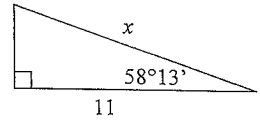
Section II – Measurement (23 marks)

- 1.
2. Convert the following units. [2]
- a) $50^{\circ}24' = 50.4$ degrees
- b) $2.3\text{m}^2 = 23\ 000$ cm^2
-
3. The water from a flat rectangular roof $12\text{m} \times 15\text{m}$ is collected in a cylindrical water tank of diameter 2.2m .
- a) If 10mm of rain falls on the roof, find the [1] volume of water which has fallen on the roof.
- $1200\text{cm} \times 1500\text{cm} \times 1\text{cm}$
 $= 1800\ 000\ \text{cm}^3$
 $= 1800\ \text{L}$
- b) What is the rise in the water level of the tank when this volume of water is collected? (nearest cm) [2]
- $1800\ \text{cm} = 18\text{m}$
- $V = \pi r^2 h$
 $1.8\text{m}^3 = \pi \times 1.1^2 \times h$
- c) The cylindrical water tanks is 1.5m high. The curved part of the tank is to be painted with rust proofing. What is the area to be painted to the nearest m^2 ? [2]
- $2 \times \pi \times 1.1 \times 1.5$
 $= 10\ \text{m}^2$ (nearest m^2).
-
4. Answer each of the following.
- a) Given $\tan \theta^{\circ} = \frac{26.1}{8.7}$, find θ° to the nearest minute. [1]
- $\theta^{\circ} = 71^{\circ}34'$ (nearest minute)

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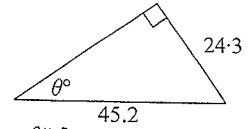
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b) Find x to 1 decimal place. [2]



$\cos 58^{\circ}13' = \frac{11}{x}$
 $x = \frac{11}{\cos 58^{\circ}13'}$
 $= 20.9$ (1 dec. pl.)

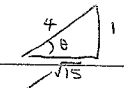
c) Find θ° to the nearest degree. [2]



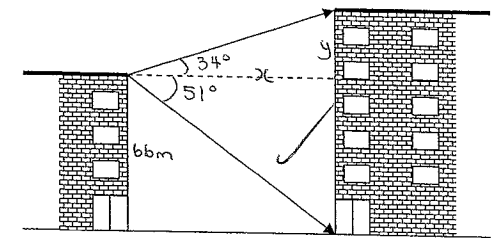
$\sin \theta^{\circ} = \frac{24.3}{45.2}$
 $\theta = 33^{\circ}$ (nearest degree).

5. If $\sin \theta = \frac{1}{4}$, find the exact value [2]

of $\cos \theta$.
 $\sqrt{4^2 - 1^2} = \sqrt{16 - 1}$
 $= \sqrt{15}$
 $\therefore \cos \theta = \frac{\sqrt{15}}{4}$



6. An observer, from the top of a building 66 metres high, finds the angle of elevation of the top of a taller building to be 34° . The angle of depression of the foot of the same building is 51° .
- a) Mark all the given information on the diagram given below. [1]



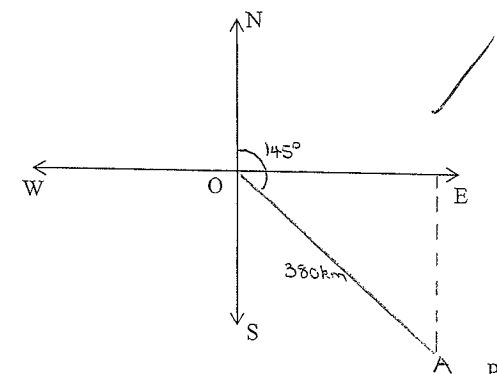
b) (i) Find the distance between the two buildings to the nearest m [2]

$\tan 51^{\circ} = \frac{66}{x}$
 $x = \frac{66}{\tan 51^{\circ}}$
 $= 53\ \text{m}$ (nearest m).

(ii) Find the height of the taller building. [2]

$\tan 34^{\circ} = \frac{y}{53}$
 $y = \tan 34^{\circ} \times 53$
 $= 35.75\text{m}$ (2 dec. pl.)
 $66\text{m} + 35.75\text{m} = 101.75\text{m}$ (2 dec. pl.)

7. A ship leaves port O and travels 380km on a bearing of 145° to port A.
- a) Put this information on the diagram. [1]



- b) How far East of port O is port A? [2]
- Answer to the nearest km
 $\cos 55^{\circ} = \frac{x}{380}$
 $x = \cos 55^{\circ} \times 380$
 $= 218\ \text{km}$ (nearest km)
- c) What is the bearing of O from A? [1]
- Answer to the nearest degree
 $\angle OAE = 180^{\circ} - 90^{\circ} - 55^{\circ} = 35^{\circ}$
 \therefore Bearing of O from A is 325° or $N35^{\circ}W$

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Section III - Algebra (43 marks)

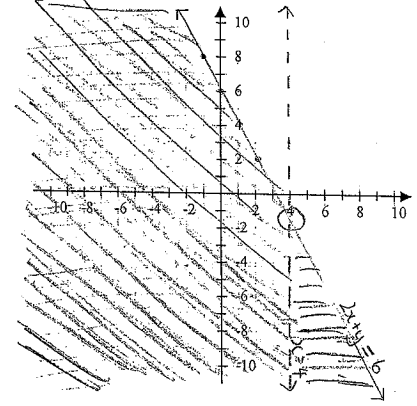
- Simplify $9p - 3p \times 2$. [1]
 $= 9p - 6p$
 $= 3p$
- Expand and simplify $(5g+3)(4g-1) - (g+2)(g-2)$. [2]
 $= (20g^2 - 5g + 12g - 3) - (g^2 - 2g + 2g - 4)$
 $= (20g^2 + 7g - 3) - (g^2 - 4)$
 $= 20g^2 + 7g - 3 - g^2 + 4$
 $= 19g^2 + 7g + 1$
- If $y = 7 + 5(4-x)$, find x , when $y = 0$. [2]
 $0 = 7 + 20 - 5x$
 $0 = 27 - 5x$
 $5x = 27$
 $x = \frac{27}{5} = 5 \frac{2}{5}$
- Solve $\frac{2x+3}{3} - \frac{3x+1}{2} = 2$. [3]
 $= \frac{4(2x+3) - 3(3x+1)}{12} = 2$
 $8x + 12 - 9x - 3 = 24$
 $-x + 9 = 24$
 $-x = 15$
 $x = -15$
- Solve $4 - 3x \leq 9$. [1]
 $-5 \leq 3x$ | $-x \geq -\frac{5}{3}$
 $3x \geq -5$ | $x \geq -1 \frac{2}{3}$
- Use an equation to solve this problem. "A number is increased by 5 and then trebled. The result is 6 more than two thirds of the number. Find the number". [3]
 $3(x+5) = \frac{2}{3}x + 6$
 $3x + 15 = \frac{2}{3}x + 6$
 $9x + 45 = 2x + 18$
 $7x = -27$
 $x = -\frac{27}{7}$
 $= -3 \frac{6}{7}$

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- The velocity of an object is given by $v^2 = u^2 + 2as$. Find u when $v = 13$, $a = 6$ and $s = 12$. [1]
 $13^2 = u^2 + (2 \times 6 \times 12)$ | $u^2 = 25$
 $169 = u^2 + 144$ | $u = \sqrt{25} = 5$ or -5
- For the points A (3, -1) and B (-5, 0), find... [1]
 a) The gradient of AB. [1]
 $m = \frac{y_2 - y_1}{x_2 - x_1}$
 $m = \frac{0 - (-1)}{(-5) - 3} = \frac{1}{(-8)} = -\frac{1}{8}$
- The distance AB. [1]
 $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
 $d = \sqrt{(-5 - 3)^2 + (0 - (-1))^2}$
 $= \sqrt{(-8)^2 + 1^2} = \sqrt{64 + 1} = \sqrt{65}$ units
- The midpoint of AB. [1]
 $M = (\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2})$
 $M = (\frac{3 + (-5)}{2}, \frac{(-1) + 0}{2}) = (\frac{-2}{2}, \frac{-1}{2}) = (-1, -\frac{1}{2})$
- The equation of the line which passes through A and B. Give your answer in general form. [3]
 $y = mx + b$ | $-\frac{3}{8}x - y - \frac{5}{8} = 0$
 $-1 = (3x - \frac{1}{8}) + b$ | $\frac{3}{8}x + y + \frac{5}{8} = 0$
 $-1 = -\frac{3}{8} + b$ | $3x + 8y + 5 = 0$
 $b = -\frac{5}{8}$
 $y = -\frac{3}{8}x - \frac{5}{8}$
- Where does the line AB cross the x-axis? [1]
 $-\frac{5}{8}$
- Find the equation of the line parallel to AB which also passes through the point (0, 8). [2]
 $y = mx + b$
 $8 = 0 + b$
 $b = 8$
 $\therefore y = -\frac{1}{8}x + 8$

- Find k if $2x + ky = 5$ is perpendicular to $x - 3y = 11$. [2]
 $ky = 5 - 2x$ | $-\frac{2}{3k} = -1$
 $y = \frac{5}{k} - \frac{2}{k}x$ | $\frac{2}{3k} = 1$
 $3y = x - 11$ | $2 = 3k$
 $y = \frac{1}{3}x - \frac{11}{3}$ | $k = \frac{2}{3}$
 $-\frac{1}{3}x - \frac{2}{k} = -1$

10. On the number plane below...



- Sketch $2x + y = 6$. [1]
- Hence shade the region where $2x + y \leq 6$. [1]
 Region = [shaded area]
- Clearly indicate on the number plane [3]
 the region where $2x + y \leq 6$ and $x < 4$
 are both true.
 Region = [shaded area]
- Factorise fully... [1]
 a) $x^2 - 5x - 6$
 $= (x - 6)(x + 1)$
- b) $x^2 - 5x - 6$
 $= (x + 1)(x - 6)$

- $5x^2 + 7x - 6$
 $= \frac{(5x - 3)(5x + 10)}{5}$
 $= (5x - 3)(x + 2)$
- $2x^3 - 18x$
 $= 2x(x^2 - 9)$
 $= 2x(x + 3)(x - 3)$
- Simplify... [1]
 a) $\frac{2a^2x}{5} \times \frac{10a^2}{4ax^2}$
 $= \frac{20a^4x}{20ax^2} = \frac{a^3}{x}$
- $\frac{x-2}{3x^2-6x}$
 $= \frac{x-2}{3x(x-2)}$
 $= \frac{1}{3x}$
- $\frac{x^2-25}{3x^2+15x} \div \frac{x^2-4x-5}{(x+5)(x-3)}$
 $= \frac{(x+5)(x-5)}{3x(x+5)} \times \frac{(x+1)(x-3)}{(x-5)(x+1)}$
 $= \frac{1}{3}$
- $\frac{2}{x^2-x} - \frac{3}{x^2-1}$
 $= \frac{2}{x(x-1)} - \frac{3}{(x+1)(x-1)}$
 $= \frac{2(x+1) - 3x}{x(x+1)(x-1)}$
 $= \frac{2x + 2 - 3x}{x(x+1)(x-1)}$
 $= \frac{-x + 2}{x(x+1)(x-1)}$

END OF EXAMINATION