

30 marks

Multiple Choice: Circle the correct answer.

1. $\frac{2x+1}{5} - \frac{x-3}{2} =$

- (A) $\frac{17-x}{10}$ (B) $\frac{-x-13}{10}$ (C) $\frac{-x-2}{7}$ (D) $\frac{13-x}{7}$

2. Which of the following expressions does NOT have $m+1$ as a factor?

- (A) $m^2 - 1$ (B) $m^2 + 1$
 (C) $m^2 + m$ (D) $m^2 + 2m + 1$

3. What is the solution to the equation: $2^x = 4\sqrt{2}$?

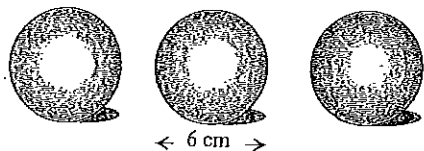
- (A) $x = \frac{1}{16}$ (B) $x = \sqrt{2}$ (C) $x = 2\sqrt{2}$ (D) $x = \frac{5}{2}$

4. If $p + q = 10$ and $p - q = 8$, what is the value of $\sqrt{p^2 - q^2}$?

- (A) $\sqrt{2}$ (B) $2\sqrt{2}$ (C) $3\sqrt{2}$ (D) $4\sqrt{5}$

5. A snooker set has identical 15 red balls, three of which are shown below. If the entire set of red balls were to be repainted, what area would need to be covered?

- (A) 848 cm²
 (B) 1 131 cm²
 (C) 1 696 cm²
 (D) 5 089 cm²



Short/extended response: show all working (25 marks)

6. Given the formula $\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$

Calculate the value f when $u = 2.5 \times 10^{-2}$ and $v = 3.6 \times 10^{-3}$.

Leave your answer in scientific notation correct to two significant figures.

2

7. Simplify fully:

(i) $\sqrt{32}$

1

(ii) $\sqrt{18} - \sqrt{27} + 4\sqrt{50}$

2

8. Express $\frac{3\sqrt{2}+1}{2\sqrt{3}}$ with a rational denominator.

2

9. Simplify $\frac{x^2-1}{x-3} \times \frac{x^2-3x}{2x-2}$ as a single fraction in simplest form.

2

10. Completely factorise the following

(i) $x^2 - 5x - 6$

2

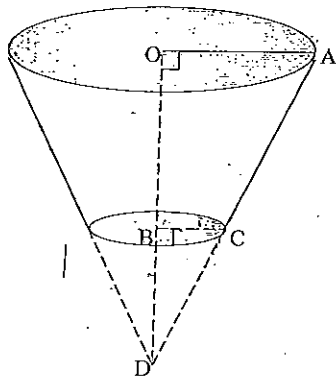
(ii) $2x^3 - 98x$

2

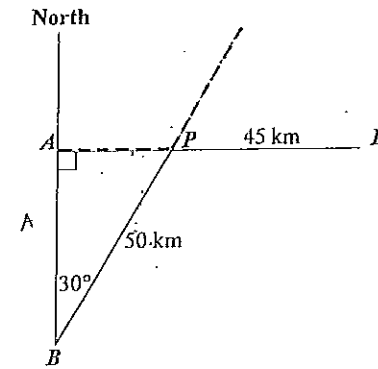
(iii) $6x^2 - 3xy - 4xz + 2yz$

2

11. Consider the following solid, where $BC = 4$ cm, $OA = 6$ cm, $AD = 12$ cm, $BD = 3$ cm. Calculate the *exact* surface area of the remaining *closed* shape.
[Surface area of a cone = $\pi rl + \pi r^2$]



12. In the diagram, the point P is on a bearing of 30° and 50 km from B . P is also 45 km due west of D and due East of A .



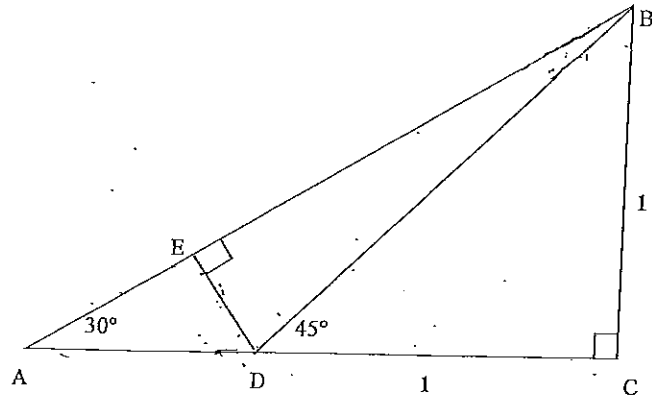
(i) What is the size of $\angle BPD$?

1

(ii) Calculate the distance D is East of A .

2

13. Consider the following diagram:



(i) Give the exact value of $\sin 45^\circ$.

1

(ii) Find the length of AD in exact form.

2

(iii) Hence, show that $ED = \frac{\sqrt{3}-1}{2}$

2

END OF 5.3 SECTION

Year 10 Half Yearly 2017 (5.3)

Student: SOLUTIONS

30 marks

Teacher: _____

Multiple Choice: Circle the correct answer.

1. $\frac{2x+1}{5} - \frac{x-3}{2} = \frac{4x+2-5x+15}{10} = \frac{17-x}{10}$

- (A) $\frac{17-x}{10}$ (B) $\frac{-x-13}{10}$ (C) $\frac{-x-2}{7}$ (D) $\frac{13-x}{7}$

2. Which of the following expressions does NOT have $m+1$ as a factor?

- (A) $m^2-1 = (m+1)(m-1)$ (B) m^2+1 Can't be factorised.
 (C) $m^2+m = m(m+1)$ (D) $m^2+2m+1 = (m+1)^2$

3. What is the solution to the equation: $2^x = 4\sqrt{2}$? $2^x = 2^{2.5}$

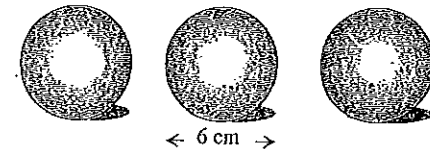
- (A) $x = \frac{1}{16}$ (B) $x = \sqrt{2}$ (C) $x = 2\sqrt{2}$ (D) $x = \frac{5}{2}$

4. If $p+q=10$ and $p-q=8$, what is the value of $\sqrt{p^2-q^2}$? $= \sqrt{10 \times 8} = 4\sqrt{5}$

- (A) $\sqrt{2}$ (B) $2\sqrt{2}$ (C) $3\sqrt{2}$ (D) $4\sqrt{5}$

5. A snooker set has identical 15 red balls, three of which are shown below. If the entire set of red balls were to be repainted, what area would need to be covered?

- (A) 848 cm²
 (B) 1 131 cm²
 (C) 1 696 cm²
 (D) 5 089 cm²



$$SA = 4\pi r^2 \times 15$$

$$= 4 \times (3)^2 \times 15$$

Short/extended response: show all working (25 marks)

6. Given the formula $\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$

Calculate the value f when $u = 2.5 \times 10^{-2}$ and $v = 3.6 \times 10^{-3}$.
Leave your answer in scientific notation correct to two significant figures.

$$\begin{aligned} \frac{1}{f} &= \frac{u+v}{uv} \\ f &= \frac{uv}{u+v} \\ &= \frac{2.5 \times 10^{-2} \times 3.6 \times 10^{-3}}{2.5 \times 10^{-2} + 3.6 \times 10^{-3}} \\ &= 3.1 \times 10^{-3} \end{aligned}$$

7. Simplify fully:

(i) $\sqrt{32} = \sqrt{16 \times 2} = 4\sqrt{2}$

(ii) $\begin{aligned} \sqrt{18} - \sqrt{27} + 4\sqrt{50} \\ &= \sqrt{9 \times 2} - \sqrt{9 \times 3} + 4\sqrt{25 \times 2} \\ &= 3\sqrt{2} - 3\sqrt{3} + 20\sqrt{2} \\ &= 23\sqrt{2} - 3\sqrt{3} \end{aligned}$

8. Express $\frac{3\sqrt{2}+1}{2\sqrt{3}}$ with a rational denominator.

$$\frac{3\sqrt{2}+1}{2\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{3\sqrt{6}+\sqrt{3}}{6}$$

9. Simplify $\frac{x^2-1}{x-3} \times \frac{x^2-3x}{2x-2}$ as a single fraction in simplest form.

$$\begin{aligned} &= \frac{(x+1)\cancel{(x-1)}}{\cancel{x-3}} \times \frac{x\cancel{(x-3)}}{2\cancel{(x-1)}} \\ &= \frac{x(x+1)}{2} \end{aligned}$$

10. Completely factorise the following

(i) $x^2 - 5x - 6$

$$(x-6)(x+1)$$

(ii) $2x^2 - 98x = 2(x^2 - 49)$

$$= 2(x+7)(x-7)$$

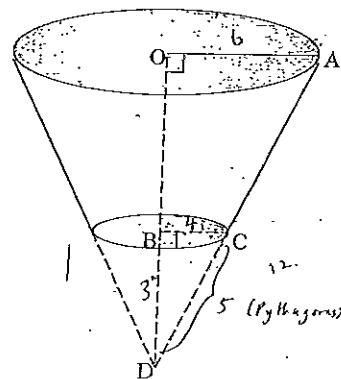
(iii) $6x^2 - 3xy - 4xz + 2yz$

$$= 3x(2x-y) - 2z(2x-y)$$

$$= (3x-2z)(2x-y)$$

11. Consider the following solid, where $BC = 4$ cm, $OA = 6$ cm, $AD = 12$ cm, $BD = 3$ cm. Calculate the exact surface area of the remaining closed shape.

[Surface area of a cone = $\pi rl + \pi r^2$]



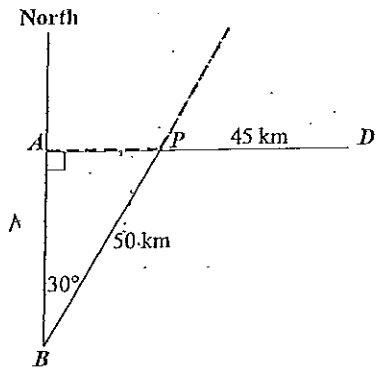
Large circle: $A = \pi r^2 = 36\pi$

Small circle: $A = \pi r^2 = 16\pi$

Curved surface: $A = \pi RL - \pi r'l = 72\pi - 20\pi = 52\pi$

\Rightarrow Area = $36\pi + 16\pi + 52\pi = 104\pi$

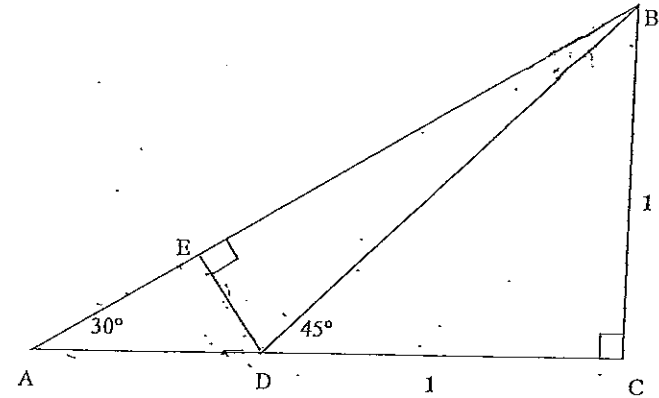
12. In the diagram, the point P is on a bearing of 30° and 50 km from B .
 P is also 45 km due west of D and due East of A .



- (i) What is the size of $\angle BPD$? 1
- $\angle APB = 60^\circ$ (Complementary \angle 's of Right \angle Δ)
- $\angle BPD = 180 - 60$ (\angle sum of straight line)
- $= 120^\circ$
- (ii) Calculate the distance D is East of A . 2

$$\begin{aligned} AP &= 50 \sin 30^\circ \\ &= 25 \text{ km} \\ AD &= 25 + 45 \\ &= 70 \text{ km} \end{aligned}$$

13. Consider the following diagram:



- (i) Give the exact value of $\sin 45^\circ$. 1

$$\frac{1}{\sqrt{2}}$$

- (ii) Find the length of AD in exact form. 2

$$\tan 30^\circ = \frac{BC}{AD+DC} = \frac{1}{AD+1}$$

$$\frac{1}{\sqrt{3}} = \frac{1}{AD+1}$$

$$AD+1 = \sqrt{3}$$

$$AD = \sqrt{3} - 1$$

- (iii) Hence, show that $ED = \frac{\sqrt{3}-1}{2}$. 2

$$ED = AD \sin 30^\circ$$

$$\begin{aligned} &= \frac{1}{2} AD \\ &= \frac{\sqrt{3}-1}{2} \end{aligned}$$

END OF 5.3 SECTION