DUNMAN SECONDARY SCHOOL

CANDIDATE NAME			
CLASS		**INDEX NUMBER**	

PRELIMINARY EXAMINATION 2025
SECONDARY 4 EXPRESS/ 5 NORMAL ACADEMIC

MATHEMATICS **4052/01**

Paper 1

2 hours 15 minutes

Solutions

Downloaded from SingaKids.com

Qn	Answer
1(a)	Inconsistent *y*-axis scale
1(b)	The revenue growth appears to be more than doubled from 2020 compared to 2024 when in actual fact only increased from about \$500 000 to \$800 000.

Qn	Answer
2	In Italy, $830 \times 1.4893 = \$1236.119$ In Singapore, $830 \div 0.6747 = \$1230.176375$ Difference = \$5.94

Qn	Answer
3(a)	$\sin x = \frac{1}{3}$ $x = 19.47122...$ or $160.5287...$ $=19.5°$ or $160.5°$ (1 d.p.)
3(b)	$26° = 0.45378... = 0.454$ (3 s.f.)

Qn	Answer
4	Amount of liquid in bottles *B* and *C* $= 300 \div 15 \times 13 = 260$ ml Amount of liquid in bottle *A* = 40 ml Amount of liquid left in bottle *A* $= 260 \div 65 \times 7 = 28$ ml $n = 40 - 28 = 12$ **OR** 2 : 8 : 5 is equivalent to 10 : 40 : 25 75 units rep. 300 ml 1 unit rep. 4 ml $n = 4 \times (10 - 7) = 12$

Downloaded from SingaKids.com

Qn	Answer
5(a)	$\left(\frac{27a^{12}}{b^3}\right)^{-\frac{2}{3}}$ $=\left(\frac{b^3}{27a^{12}}\right)^{\frac{2}{3}}$ $=\frac{b^2}{9a^8}$
5(b)	$13\times 9^2-4\times 3^4=3^p$ $13\times 3^4-4\times 3^4=3^p$ $3^4(13-4)=3^p$ $3^4\times 3^2=3^p$ $p=6$

Qn	Answer
6	$F=\frac{k}{r^2}$ $F_1=\frac{k}{(3r)^2}=\frac{k}{9r^2}=\frac{1}{9}\left(\frac{k}{r^2}\right)=\frac{1}{9}F$ He is not correct since the force should be $\frac{1}{9}$ instead.

Qn	Answer
7(a)	$300\text{ km}\div 2\text{hour}=150\text{ km/h}$
7(b)	Since distance is rounded down and time is rounded up, this speed will be lower than the actual speed.
7(c)	227 km/h $=227\times 1000\div 3600$ $=63.1$ m/s

Qn	Answer
8(a)	$16a^2b-8ab^2$ $=8ab(2a-b)$
8(b)	$3c-4d+3cd-4$ $=3c(1+d)-4(1+d)$ $=(3c-4)(1+d)$

Downloaded from SingaKids.com

Qn	Answer
9	$29\ \text{cm}^2 : 728.6\ \text{km}^2$ $\sqrt{29}\ \text{cm} : \sqrt{728.6}\ \text{km}$ $5.3852\ \text{cm} : 26.993\ \text{km}$ (5 s.f.) $1\ \text{cm} : 5.0124\ \text{km}$ (5 s.f.) $1 : 501244$ $1 : 5\times10^5$ $n = 5\times10^5$

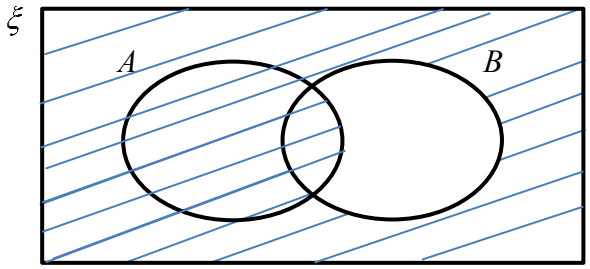
Qn	Answer
10	$\frac{5x}{18} - \frac{5x+12}{54} - \frac{2(x-1)}{27}$ $= \frac{15x-5x-12-4(x-1)}{54}$ $= \frac{10x-12-4x+4}{54}$ $= \frac{6x-8}{54}$ $= \frac{3x-4}{27}$

Qn	Answer
11	$OD = OB$ (radius of circle) $OC = OA$ (radius of circle) $CD = AB$ (equal chords) Therefore, triangles OAB and OCD are congruent by SSS congruency test.

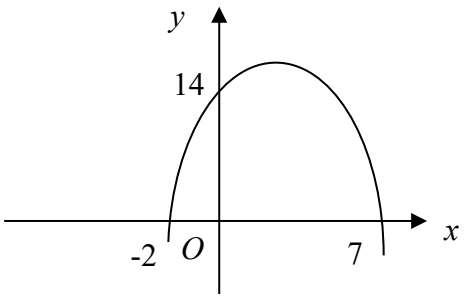
Downloaded from SingaKids.com

Qn	Answer
12	$\dfrac{2x^2+7x-15}{16x^4-81}$ $=\dfrac{(2x-3)(x+5)}{(4x^2)^2-9^2}$ $=\dfrac{(2x-3)(x+5)}{(4x^2-9)(4x^2+9)}$ $=\dfrac{(2x-3)(x+5)}{(2x-3)(2x+3)(4x^2+9)}$ $=\dfrac{x+5}{(2x+3)(4x^2+9)}$

Question	Answer
13(a)	$7-10x+x^2$ $=x^2-10x+7$ $=(x-5)^2-5^2+7$ $=(x-5)^2-18$
13(b)	$x=5$

Question	Answer
14(a)(i)	1, 4, 6, 8, 9, 10, 12, 14
14(a)(ii)	Since perfect squares have more than 2 factors, they will never be prime numbers. Hence, $X \cap Y = \phi$
14(b)	

Downloaded from SingaKids.com

Question	Answer
15	

Question	Answer
16	$\frac{4}{3}\pi(2r)^3 = 2\times\frac{1}{3}\pi\left(\frac{2}{3}r\right)^2\times 10h$ $\frac{32\pi r^3}{3} = \frac{80\pi r^2 h}{27}$ $32r\times 27 = 3\times 80h$ $864r = 240h$ $\frac{h}{r} = \frac{864}{240}$ $h:r = 18:5$

Question	Answer
17	angle $ABC = 108°$ angle $FBC = 360° - 108° - 100°$ ($\measuredangle s$ at a point) $= 152°$ exterior angle $= 180° - 152° = 28°$ for regular polygon $= \frac{360°}{28°}$ $= 12.85...$ not whole number For a regular polygon, they have equal angles. Hence, $360°$ is not divisible by $28°$, the second polygon is not regular.

Downloaded from SingaKids.com

Question	Answer
18(a)	$\sqrt{(-4)^2+(-3)^2}=5$
18(b)	gradient = $\frac{-3}{-4}=\frac{3}{4}$ Equation: $y=\frac{3}{4}x+c$ $-5=\frac{3}{4}(2)+c$ $c=-\frac{13}{2}$ $y=\frac{3}{4}x-\frac{13}{2}$ or $-6\frac{1}{2}$ or -6.5
18(c)	x-coordinates = $2+\frac{3}{4}(4)=5$ y-coordinates = $-5+\frac{3}{4}(3)=-2\frac{3}{4}$ R = (5, -2.75)

Question	Answer
19	$16=ka^0 \Rightarrow k=16$ $64=16a^{-2}$ $a^2=\frac{1}{4}$ $a=\frac{1}{2}$ (rej. -ve)

Downloaded from SingaKids.com

Question	Answer
20	$\frac{A_1}{A_2}=\left(\frac{l_1}{l_2}\right)^2$ $\frac{4}{5}=\left(\frac{l_1}{30}\right)^2$ $\sqrt{\frac{4}{5}}=\frac{l_1}{30}$ $l_1=30\times\sqrt{\frac{4}{5}}=26.832$ cm (5 s.f.) length $=30-26.832=3.17$ (3 s.f.)

Question	Answer
21(a)	Probability $=\frac{5}{9}\times\frac{4}{8}+\frac{4}{9}\times\frac{3}{8}=\frac{4}{9}$
21(b)	Probability $=\frac{5}{9}\times\frac{4}{8}+\frac{4}{9}\times\frac{5}{8}=\frac{5}{9}$

Question	Answer
22(a)	mean $=\frac{15\times4.25+29\times4.75+12\times5.25+34\times5.75+10\times6.25}{100}$ $=5.225$ mean = \$5225
22(b)	Standard deviation = \$637.87 or \$638
22(c)	Mean remains unchanged, standard deviation becomes smaller

Question	Answer
23(a)	Angle NAB = 52° Angle $N_1BA = 180° - 52° = 128°$ (interior angles, NA // N_1B) Bearing of A from B = 360° − 128° = 232°
23(b)	BP = 2.1 cm

Downloaded from SingaKids.com

Question	Answer
24(a)	$5y = 6x - 2 \times 2$: $10y = 12x - 4$ -- (1) $2y = 5x - 6 \times 5$: $10y = 25x - 30$ -- (2) (2) – (1): $13x - 26 = 0$ $x = 2$, $y = 2$ $\therefore$ (2, 2)
24(b)	For $py = 3x - 1$ not to intersect with $5y = 6x - 2$, **they must be parallel.** $y = \frac{3}{p}x - \frac{1}{p}$ $\frac{3}{p} = \frac{6}{5} \Rightarrow p = \frac{5}{2}$ $l_3 : y = \frac{6}{5}x - \frac{2}{5}$ Since line l_1 and l_3 have the same equation, they will intersect. Therefore, it is not possible to find a value of p that the lines will not intersect.

Question	Answer
25(a)	$\mathbf{Q} = \begin{pmatrix} 1.20 \\ 1.50 \\ 1.80 \end{pmatrix}$
25(b)	**T = PQ** $= \begin{pmatrix} 60 & 80 & 50 \\ 50 & 90 & 70 \end{pmatrix} \begin{pmatrix} 1.20 \\ 1.50 \\ 1.80 \end{pmatrix}$ $= \begin{pmatrix} 72 + 120 + 90 \\ 60 + 135 + 126 \end{pmatrix}$ $= \begin{pmatrix} 282 \\ 321 \end{pmatrix}$
25(c)	282 and 321 represents the total revenue by Class A and class B respectively.
25(d)	$\mathbf{D} = \begin{pmatrix} 0.8 & 0.9 \end{pmatrix}$

Downloaded from SingaKids.com

Question	**Answer**
26(a)	$2\times3^3=54$ and $2^3\times3^2=72$
26(b)(i)	All prime factors have even indices/powers Or $2^4\times3^6=\left(2^2\times3^3\right)^2$ and therefore, a perfect square
26(b)(ii)	$11664\div\frac{6}{m}$ $=2^4\times3^6\div\frac{6}{m}$ $=2^4\times3^6\times\frac{m}{6}$ $=2^3\times3^5\times m$ $m=3$

Downloaded from SingaKids.com

Question	**Answer**
27(a)	$\text{acceleration} = \dfrac{5-3}{10-8} = 1 \text{ m/s}^2$
27(b)(i)	$\text{Distance} = \dfrac{1}{2}(T+10)\times 5 = 25 + 2.5T$ OR $\text{Distance} = 5\times 10 + \dfrac{1}{2}\times 5\times (T-10) = 25 + 2.5T$
27(b)(ii)	Acceleration after 8 seconds = 1 m/s^2 Let speed of B at $T = s$ m/s $\dfrac{s-3}{T-8} = 1$ $s = T - 5$ Distance travelled by B $= 3\times 8 + \dfrac{1}{2}(3+s)(T-8)$ $= 24 + \dfrac{1}{2}(3+T-5)(T-8)$ $= 24 + \dfrac{1}{2}(T-2)(T-8)$ When A and B meet, $24 + \dfrac{1}{2}(T-2)(T-8) = 25 + 2.5T$ $\dfrac{1}{2}(T-2)(T-8) = 2.5T + 1$ $T^2 - 10T + 16 = 5T + 2$ $T^2 - 15T + 14 = 0$ (shown)
27(b)(iii)	$(T-14)(T-1) = 0$ $T = 14$ or $T = 1$ (rej.)

Downloaded from SingaKids.com