The following errata were made on 25/Jun/2020

**page 214 INVESTIGATION 2 Question 5**, should read:

5 \( u_n = u_0e^{rt} \), \( u_0 = 1000 \), \( r = 0.06 \), \( t = 1 \)
\[ \therefore \quad u_n = 1000 \times e^{0.06 \times 1} \approx 1061.84 \]

The final amount is \$1061.84.\]

**page 260 INVESTIGATION 3 Question 2 c**, replace entirely with:

2 c From b, \( f = 261.6 \times 2^n \)
\[ \therefore \quad n = \log_2 \left( \frac{f}{261.6} \right) \]

Let \( f_P \) and \( f_Q \) be the frequencies of notes P and Q respectively, where Q is one note above P. There are 12 notes in an octave, and they are evenly spaced on the logarithmic scale.

\[ \therefore \quad \log_2 \left( \frac{f_Q}{f_P} \right) = \frac{1}{12} \]
\[ \therefore \quad \frac{f_Q}{f_P} = 2^{\frac{1}{12}} \]

So, the ratio between the frequencies of two consecutive notes is \( 2^{\frac{1}{12}} : 1 \approx 1.06 : 1. \)
The following errata were made on 20/May/2020

page 613 REVIEW SET 13B Question 20 b, should read:

\[ f(x) = \sqrt{\cos x} = (\cos x)^{\frac{1}{2}} \]

\[ f'(x) = \frac{1}{2}(\cos x)^{-\frac{1}{2}}(-\sin x) = -\frac{\sin x}{2\sqrt{\cos x}} \]

From a, since \( f(x) \) is only defined when \( 0 \leq x \leq \frac{\pi}{2} \) and \( \frac{3\pi}{2} \leq x \leq 2\pi \), we only consider these values of \( x \).

When \( 0 \leq x < \frac{\pi}{2} \), \( f'(x) \leq 0 \)

When \( \frac{3\pi}{2} < x \leq 2\pi \), \( f'(x) \geq 0 \)

\[ \therefore f(x) \text{ is increasing for } \frac{3\pi}{2} \leq x \leq 2\pi, \text{ and decreasing for } 0 \leq x \leq \frac{\pi}{2}. \]

page 666 EXERCISE 15D Question 5 e, should read:

\[ \frac{d}{dx} F(x) = f(x) \quad \text{and} \quad \frac{d}{dx} G(x) = g(x) \]

\[ \therefore \frac{d}{dx} [F(x) + G(x)] = f(x) + g(x) \]

\[ \therefore F(x) + G(x) \text{ is the antiderivative of } f(x) + g(x). \]

So,

\[ \int_{a}^{b} [f(x) + g(x)] \, dx \]

\[ = [F(b) + G(b)] - [F(a) + G(a)] \]

\[ = [F(b) - F(a)] + [G(b) - G(a)] \]

\[ = \int_{a}^{b} f(x) \, dx + \int_{a}^{b} g(x) \, dx \]

page 673 EXERCISE 16A Question 1 b, line 3 should read:

\[ \frac{d}{dx} (x^{\frac{3}{2}}) = \frac{3}{2}x^{\frac{1}{2}} = \frac{3}{2}\sqrt{x} \]

\[ \therefore \int \frac{3}{2}\sqrt{x} \, dx = x^{\frac{3}{2}} + c \]

\[ \therefore \frac{3}{2} \int \sqrt{x} \, dx = x^{\frac{3}{2}} + c \]

\[ \therefore \int \sqrt{x} \, dx = \frac{2}{3}x^{\frac{3}{2}} + c \]
EXERCISE 16A Question 6 b, should read:

\[ \frac{d}{dx} [F(x) + G(x)] = F'(x) + G'(x) \]

\[ = f(x) + g(x) \]

b Using a, \[ \int [f(x) + g(x)] \, dx = F(x) + G(x) + c \]

\[ = \int f(x) \, dx + \int g(x) \, dx \]

EXERCISE 16C Question 7 c, line 10 should read:

But \( f(0) = 3 \), so \( -\cos 0 + d = 3 \)

\[ \therefore -1 + d = 3 \]

\[ \therefore d = 4 \]

\[ \therefore f(x) = -\cos x - x + 4 \]

EXERCISE 19D Question 3 b, should read:

There is a strong, negative correlation between petrol price and the number of customers.

ACTIVITY 3 Question 2 a, text for residual plots C and D should read:

Most of the residuals in this plot are below the x-axis, with only three residuals above it. The scatter plot shows that only three data values are above the regression line, and the values on the x-axis correspond to those on the scatter diagram.

So C is the correct residual plot.

This is very similar to residual plot C, except the values on the x-axis do not correspond to those on the scatter diagram.

So D is not the correct residual plot.
4 b The regression line of $y$ against $x$ is $y = ax + b$.
The regression line of $x$ against $y$ is $x = \frac{1}{m} y - c$.

In the regression of $y$ against $x$, when $x = \overline{x}$, $y = a\overline{x} + b$

$= a\overline{x} + \overline{y} - a\overline{x}$

$= \overline{y}$

and in the regression of $x$ against $y$, when $y = \overline{y}$, $x = m\overline{y} + c$

$= m\overline{y} + \overline{x} - m\overline{y}$

$= \overline{x}$

So, both lines pass through the mean point $(\overline{x}, \overline{y})$, which means the lines will be the same if and only if their gradients are equal.

: the regression lines will be the same if $a = \frac{1}{m}$

: $am = 1$

: $r^2 = 1$ \{using a\}

10 a Let $X$ units be the drop in blood pressure of a randomly selected patient.

$X \sim N(5.9, 1.9^2)$

: $P(X > 4) \approx 0.84134 \approx 0.841$

: about 84.1\% of patients show a drop of more than 4 units.

b Let $Y$ be the number of patients with a drop of more than 4 units.

$Y \sim B(8, 0.84134)$

: $P(Y \geq 6) \approx 0.880$

1 c It is reasonable to compare Emma’s performances using $z$-scores as the scores in each of Emma’s classes are normally distributed.

3 k

$P(-1.645 \leq Z \leq 1.645) \approx 0.900$
EXERCISE 6H

4. For \( x > 0 \), \( y = \ln(x^2) \) and \( x > 0 \) is a vertical translation of \( y = 2 \ln x \), 2 units upwards.

So, the \( y \)-values are twice as large for \( y = \ln(x^2) \) as they are for \( y = \ln x \). Therefore, yes, Kelly is correct.

EXERCISE 6H

5. For \( x > 0 \), \( y = \ln(x^2) + 2 = 2 \ln x + 2 \) is a reflection of \( y = \ln(x^2) + 2 \), \( x > 0 \), in the \( y \)-axis.
\[ f(x) = x^3 - 2x^2 \]
\[ f'(x) = \lim_{h \to 0} \frac{f(x + h) - f(x)}{h} \]
\[ = \lim_{h \to 0} \frac{(x + h)^3 - 2(x + h)^2 - (x^3 - 2x^2)}{h} \]
\[ = \lim_{h \to 0} \frac{x^3 + 3x^2h + 3xh^2 + h^3 - 2(x^2 + 2xh + h^2) - x^3 + 2x^2}{h} \]
\[ = \lim_{h \to 0} \frac{3x^2h + 3xh^2 + h^3 - 2x^2 - 2x^2 + h^2}{h} \]
\[ = \lim_{h \to 0} \frac{3x^2 + 3xh + h^2 - 2x - 2h}{h} \quad \text{as} \ h \neq 0 \]
\[ = \lim_{h \to 0} (3x^2 + 3xh + h^2 - 2x - 2h) \]
\[ = 3x^2 - 4x \]

\[ \sin \alpha = -\frac{3}{4} \quad \text{and} \quad \pi \leq \alpha \leq \frac{3\pi}{2} \]
\[ a \quad \alpha \text{ is in quadrant 3, so } \cos \alpha \text{ is negative.} \]
\[ \tan \alpha = \frac{-\sqrt{7}}{3} \]
\[ \cdot \quad \cos \alpha = -\sqrt{7} \quad \{ \cos \alpha < 0 \} \]
1. Suppose \( y = x^4 \), and therefore \( \frac{dy}{dx} = 4x^3 \).
   To estimate the value of \( 1.95^4 \), we let \( x = 2 \) and \( \delta x = -0.05 \).
   Now \( \delta y \approx \frac{dy}{dx} \times \delta x \)
   \[ \approx 4x^3 \times \delta x \]
   \[ \approx 4 \times 2^3 \times (-0.05) \]
   \[ \approx -1.6 \]
   Since \( 2^4 = 16 \), we estimate that \( 1.95^4 \approx 16 - 1.6 \approx 14.4 \).
   Using technology, \( 1.95^4 \approx 14.4590 \).

4. \( f(x) = \frac{2}{\sqrt{x}} = 2x^{-\frac{1}{2}} \)
   \[ \therefore f'(x) = -x^{-\frac{3}{2}} = -\frac{1}{x\sqrt{x}} \]
   which has sign diagram:
   ![Sign Diagram]
   So, \( f(x) \) is only defined for \( x > 0 \).
   \( f(x) \) is never increasing, but is decreasing for \( x > 0 \).

14. \( u = x^2 + \frac{\pi}{8} \), \( \frac{du}{dx} = 2x \)

4. \( x(2) = 3(2) - 2\sqrt{2} \quad v(2) = 3 - \frac{3}{2}\sqrt{2} \quad a(2) = -\frac{3}{4\sqrt{2}} \)
   \[ = 6 - 2\sqrt{2} \quad \approx 0.879 \text{ cm} s^{-1} \quad \approx -0.530 \text{ cm s}^{-2} \]
   So, at time \( t = 2 \) seconds, the particle is about 3.17 cm to the right of the origin, travelling to the right at about 0.879 cm s\(^{-1}\), with decreasing speed \( (a(2) \approx -0.530 \text{ cm s}^{-2}) \).

4. There is a strong, negative, non-linear correlation between the number of workers and time.